TECHNOLOGY DEPARTMENT

POWER

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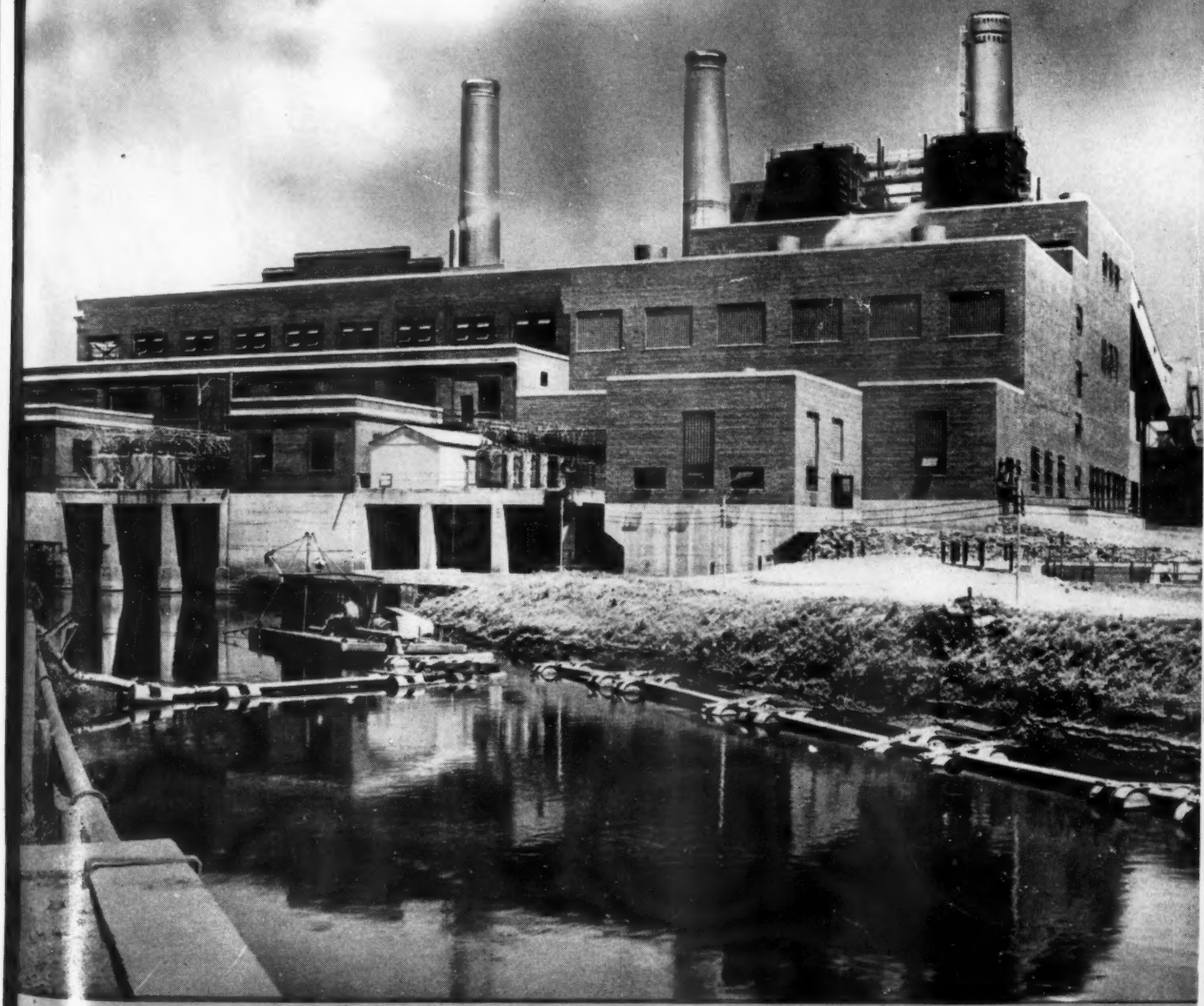
DETROIT

A McGRAW-HILL PUBLICATION DEVOTED TO GENERATION, TRANSMISSION AND APPLICATION OF THE POWER SERVICES

OCTOBER 1948

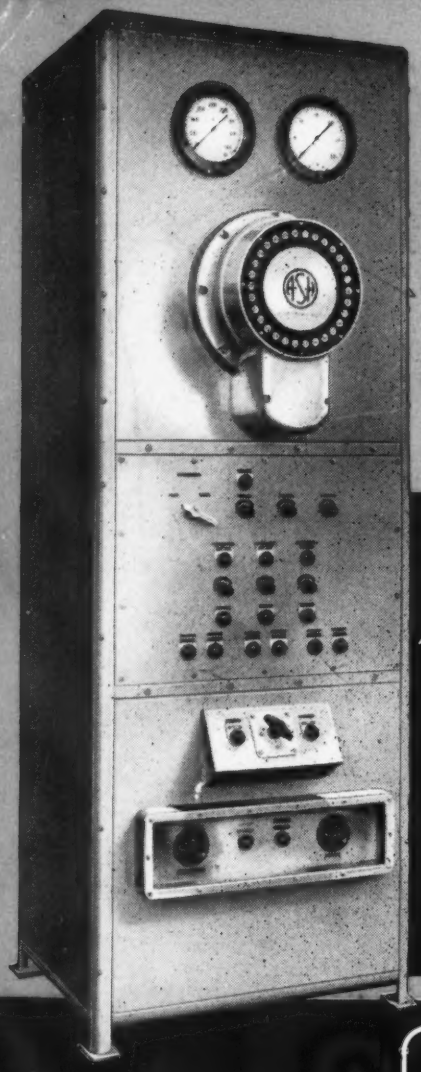


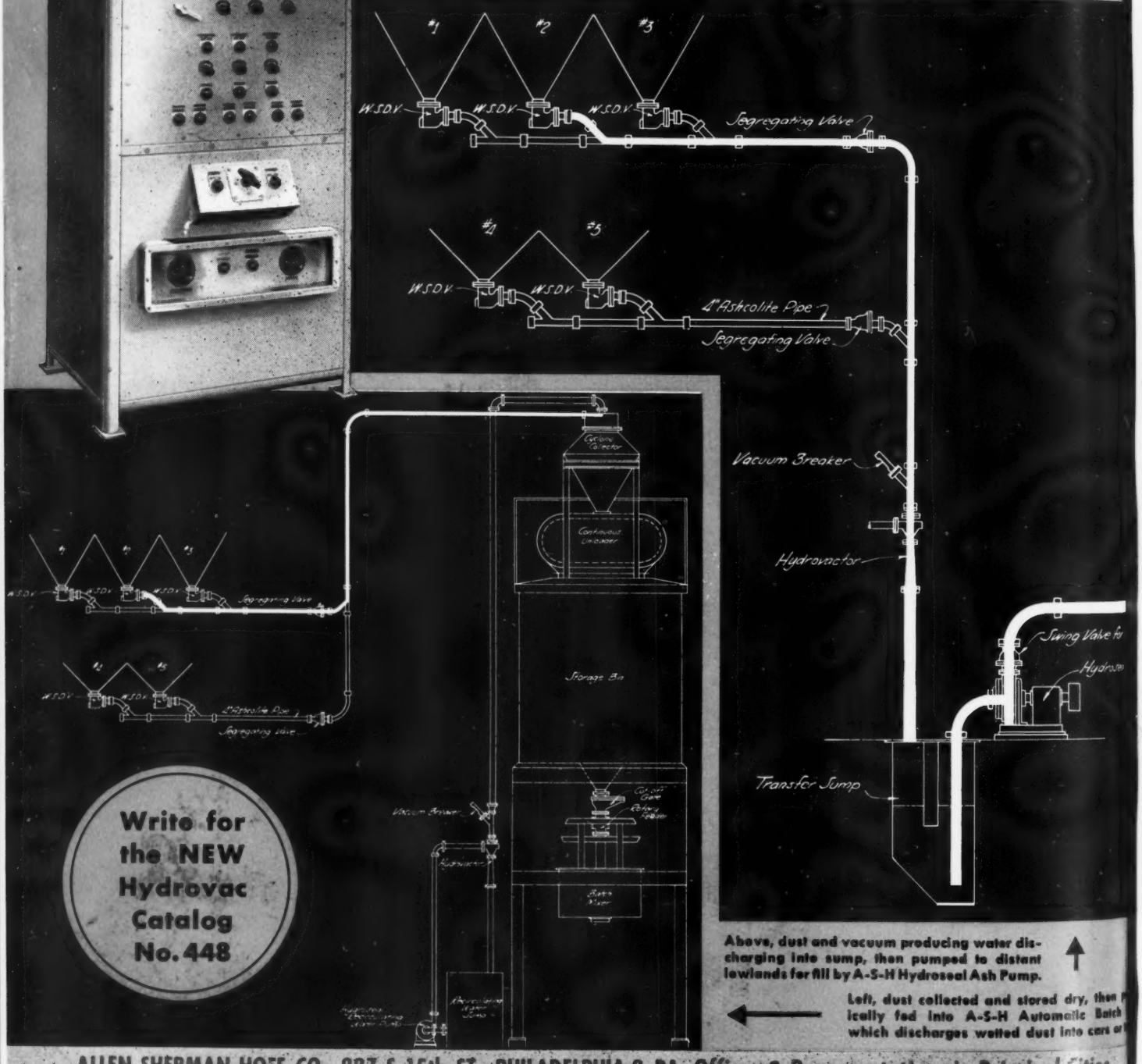
MODERN PLANT SURVEY

Tabulated technical data on more than 700 new power plants; summaries of design trends, brief descriptions of typical plants

Automatic Dust Handling Not a Luxur
For Any Size Plant! It Pays Its Wa

Push Button Dust Handling with the Automatic Sequenc Hydrovac saves enough in operating time, attendance and main- tenance to liquidate its additional cost over a hand operate Hydrovac System in a very short time. Liquid, wetted and dr dust disposal methods, developed by A-S-H, suit every plan condition. May our representative explain what "Automati Sequence Hydrovac" can DO and SAVE for YOU?





Write for the NEW Hydrovac Catalog No. 448

Above, dust and vacuum producing water discharging into sump, then pumped to distant lowlands for fill by A-S-H Hydroseal Ash Pump.

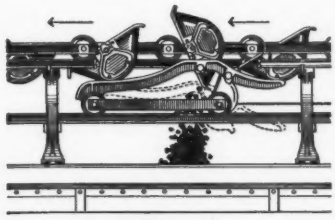
Left, dust collected and stored dry, then f ically fed into A-S-H Automatic Batch which discharges wetted dust into cars or

ALLEN-SHERMAN-HOFF CO., 227 S. 15th ST., PHILADELPHIA 2, PA. Offices & Representatives in Principal Cities

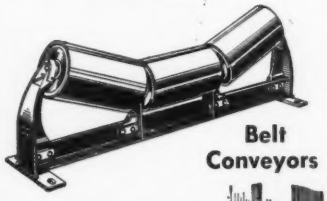
POWER (with which are consolidated "Science and Industry," "The Engineer Review," "The Engineer," "The Stationary Engineer"), October, 1948, Vol. 92, No. 10. Published monthly with an additional Directory number in June. McGraw-Hill Publishing Company, Inc. Publication office, 99-129 N. Broadway, Albany 1, N.Y. Editorial and executive offices, 330 W. 42nd St., New York 18, N.Y. Entered as second class matter August 25, 1936, at Albany, N.Y., under the act of March 3, 1879. Printed in U.S.A. Allow at least 10 days for change of address. Subscription rates, U. S. and U.S. possessions, $5 for one year, $8 for two years. 50c per single copy. Canada, $6 for one year, $9 for two years. Pan American Countries, $10 for one year, $16 for two years. All other countries $15 for one year, $25 for two years. Please indicate position and company connection on all subscription orders.

LINK-BELT EQUIPMENT

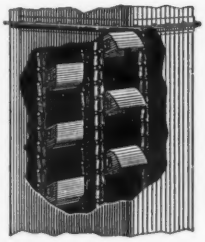
Meets Every Need of Industry in Handling Coal and Ashes



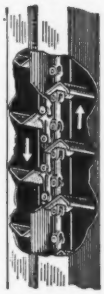
Bucket Carriers



Belt Conveyors



Bucket Elevators

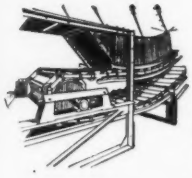


Bulk-Flo

Screw Conveyor

Skip Hoist

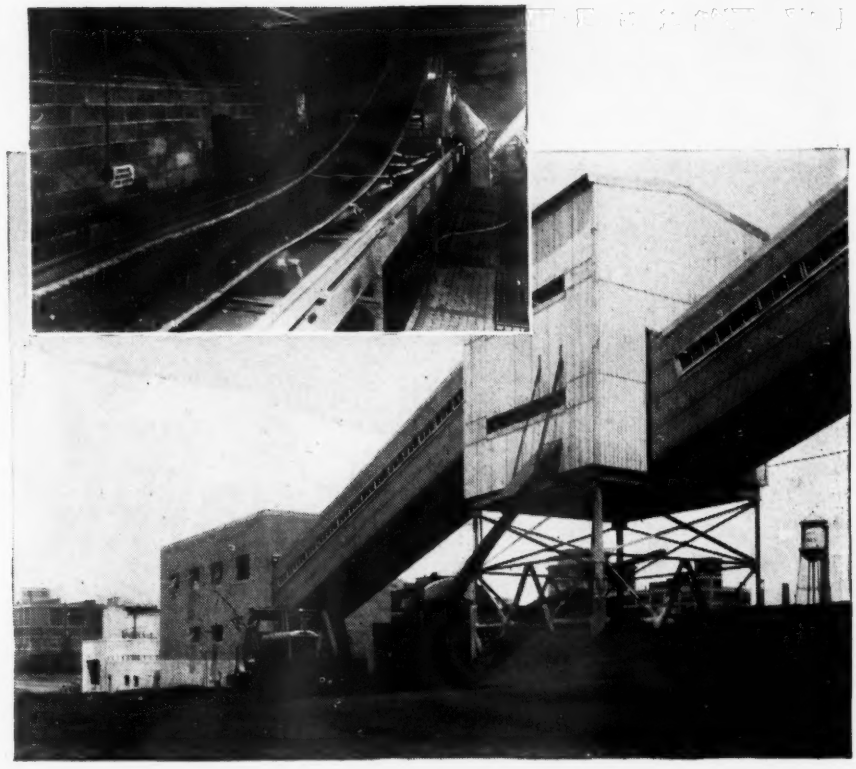
Coal Crusher



Feeders

Car Dumper

Weigh Larry



LINK-BELT 400 TPH Coal Handling System Cuts Costs at Indianapolis Perry-K Station

Modernization of the Perry-K steam-electric generating plant of the Indianapolis Power & Light Company (Gibbs & Hill, Inc., Consulting Engineers) includes a new Link-Belt coal handling system of 400 tons per hour capacity to serve 4 bunkers feeding 14 boilers.

From the Link-Belt rotary car dumper the coal goes to a 48″ roller bearing belt conveyor, by means of two inclined steel apron conveyor-feeders. The conveyor takes the coal to a ring-type crusher; another belt conveyor handles it from crusher to transfer house where it may go to ground storage by chute or to an inclined belt conveyor for delivery to distributing conveyor over bunkers in boiler house.

The list of generating plants with coal handling systems by Link-Belt is impressive. Why not apply Link-Belt "know-how" and products to your own problem?

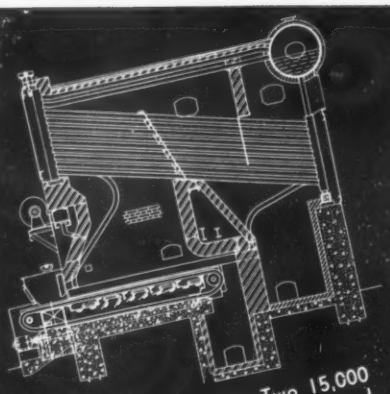
LINK-BELT COMPANY

Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Dallas 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8. Offices in Principal Cities.

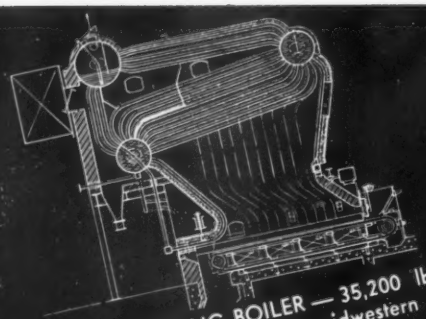
11,172

LINK BELT

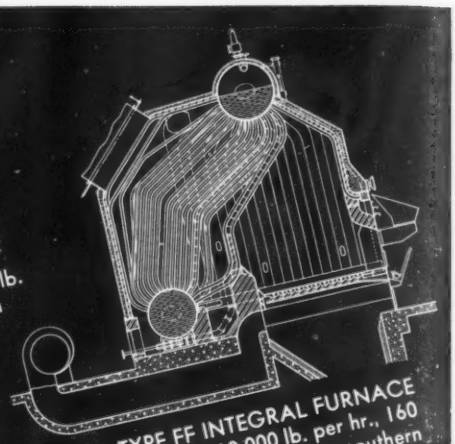
COAL AND ASHES HANDLING EQUIPMENT



DESIGN 32 BOILER—Two 15,000 lb. per hr., 200 psi, stoker-fired units in a western soybean mill.

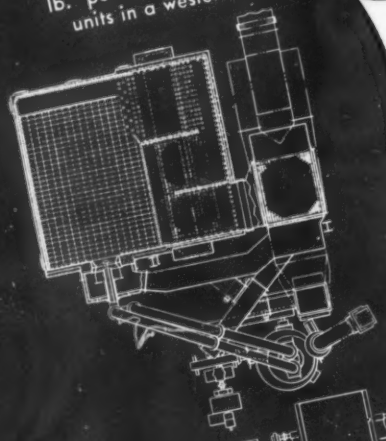


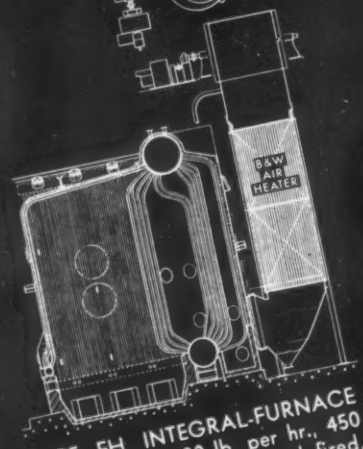
TYPE H STIRLING BOILER — 35,200 lb. per hr., 200 psi, unit in midwestern brewery.



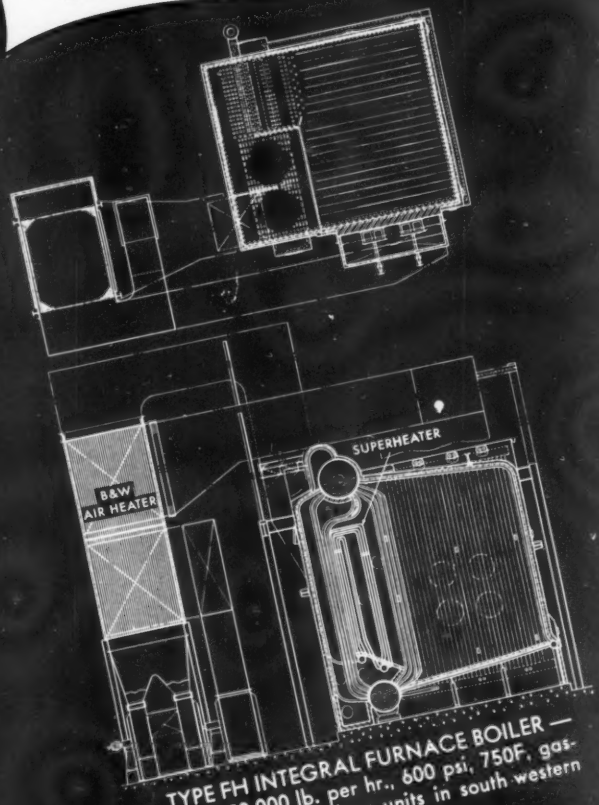
TYPE FF INTEGRAL FURNACE BOILER—19,000 lb. per hr., 160 psi, stoker-fired unit in southern textile mill.

Serving **MODERN** *Industrial Plants with* **STEAM** *that Satisfies*

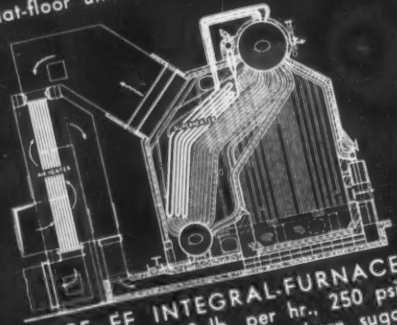




TYPE FH INTEGRAL-FURNACE BOILER — 90,000 lb. per hr., 450 psi, oil and pulverized-coal fired, flat-floor unit in eastern refinery.

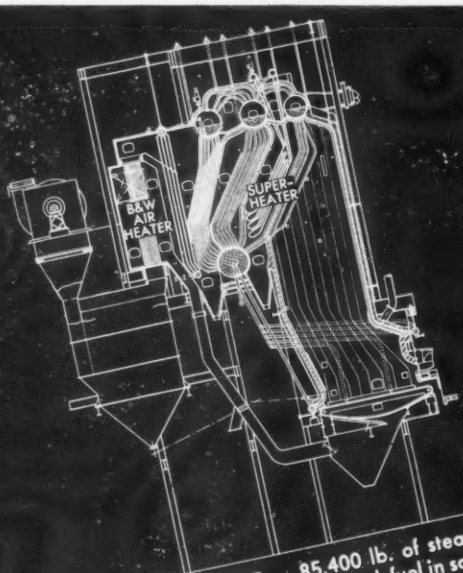


TYPE FH INTEGRAL FURNACE BOILER — Two 150,000 lb. per hr., 600 psi, 750F, gas-and-oil-fired outdoor units in south western chemical plant.

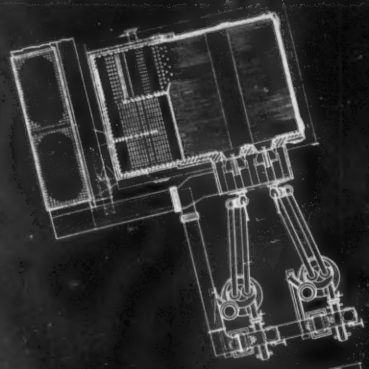


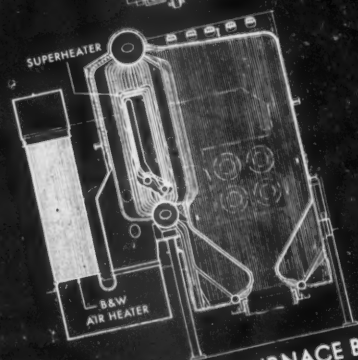
TYPE FF INTEGRAL-FURNACE BOILER—55,000 lb. per hr., 250 psi, 500F oil-fired unit in southern sugar mill.

FOR POWER PLANTS — B&W, Open-Pass, Radiant, Integral-Furnace, Cross-Drum, Stirling and Waste-Heat Stationary Boilers . . . Air Multifuel Burners . . . Chain-Grate Stokers . . . Stacks and Breechings . . . Seamless & Welded Tubes for All Pressure and Mechanical

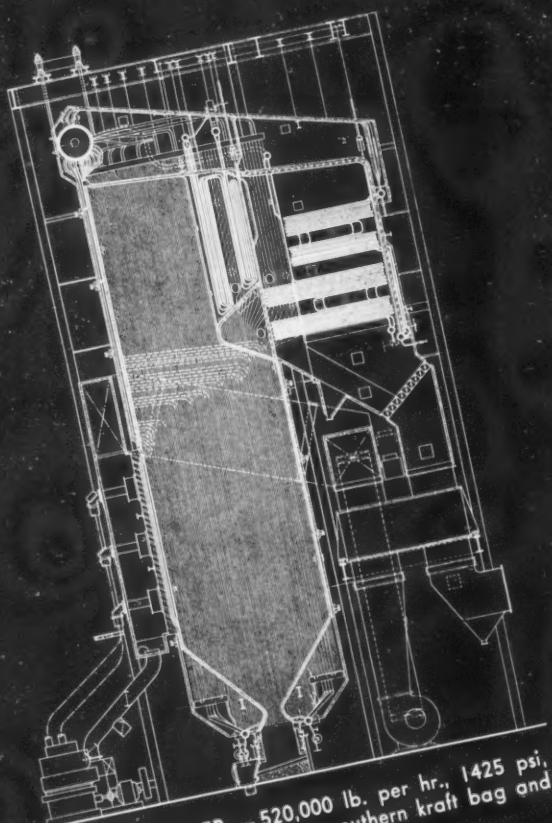


STIRLING BOILER — 85,400 lb. of steam per hr., 650 psi, 700F unit using bark fuel in southern paper mill. Future output 100,000 lb. per hr. with stoker firing.

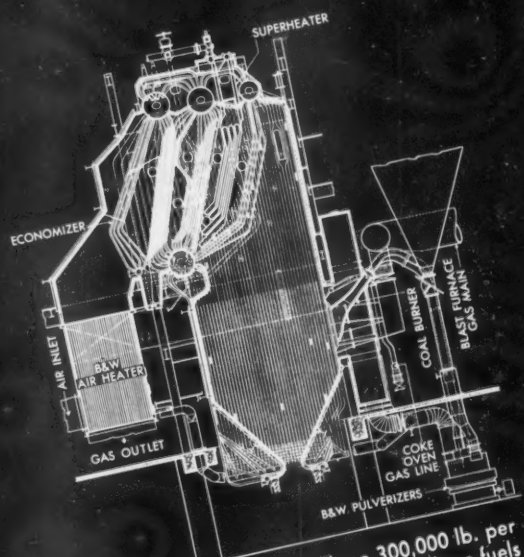




TYPE FH INTEGRAL-FURNACE BOILER — 100,000 lb. per hr., 450 psi, 650F pulverized-coal fired unit in New England manufacturing plant.



RADIANT BOILER — 520,000 lb. per hr., 1425 psi, 950F unit of this type serves southern kraft bag and paper plant.



STIRLING BOILER — Three 300,000 lb. per hr. units, 525 psi, 760F for burning three fuels separately or in combination in western steel plant.

G-409T

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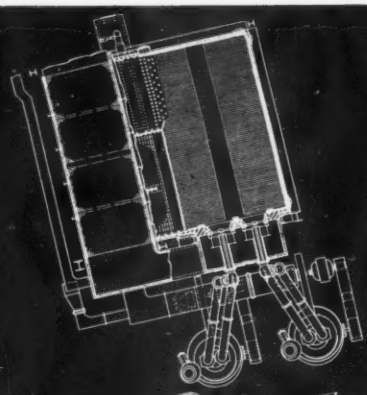
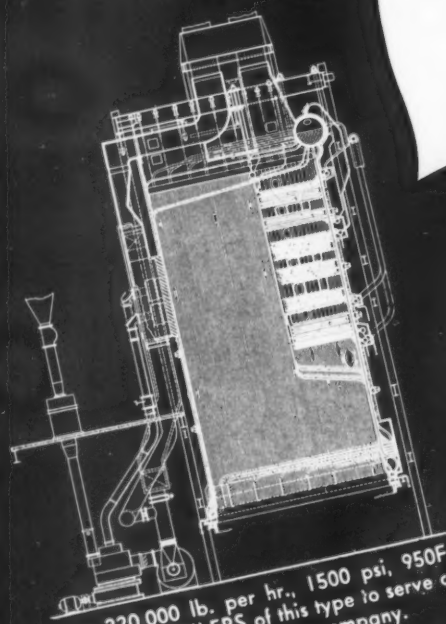
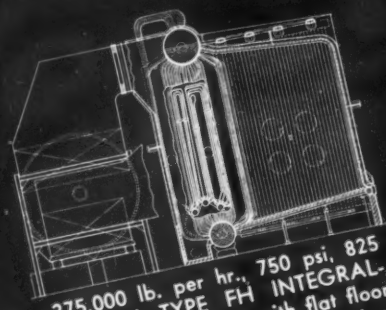
OTHER B&W PRODUCTS—Marine Boilers . . . Pressure Vessels . . . Process Equipment.

Serving MODERN *Central Stations with* STEAM *that Satisfies*

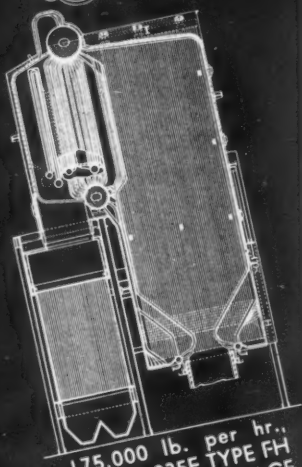




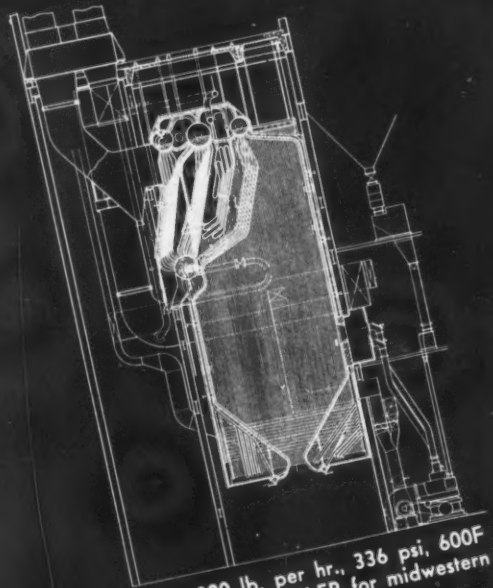
Four 220,000 lb. per hr., 1500 psi, 950F RADIANT BOILERS of this type to serve a western public power company.



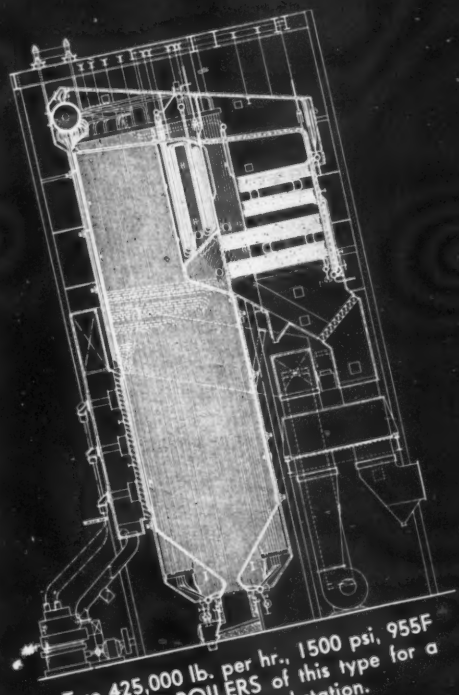
275,000 lb. per hr., 750 psi, 825 Foil-fired TYPE FH INTEGRAL-FURNACE BOILER with flat floor for a southwestern central station.



175,000 lb. per hr., 725 psi, 835F TYPE FH INTEGRAL-FURNACE BOILER for outdoor installation at midwestern central station.

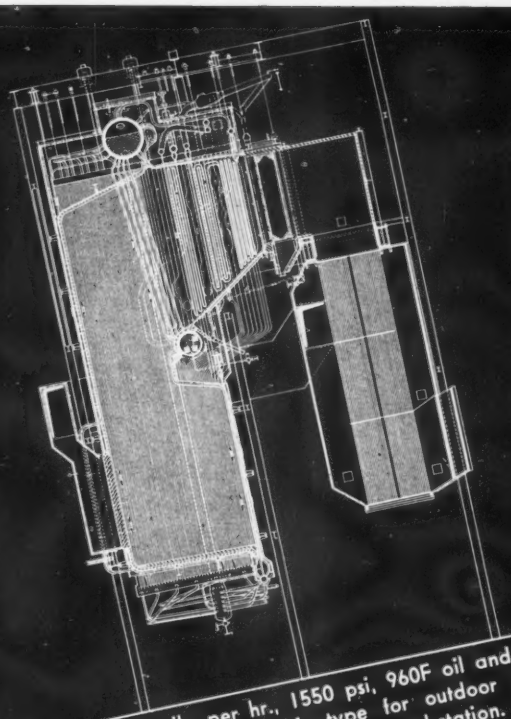


300,000 lb. per hr., 336 psi, 600F STIRLING BOILER for midwestern central station.

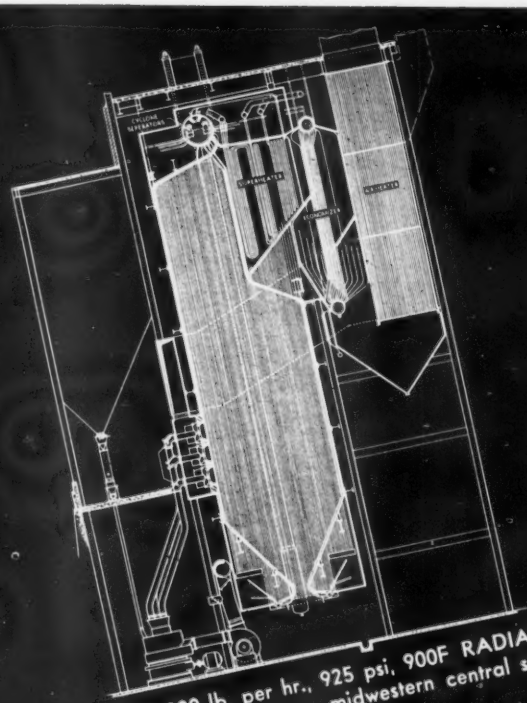


Two 425,000 lb. per hr., 1500 psi, 955F RADIANT BOILERS of this type for a southern central station.

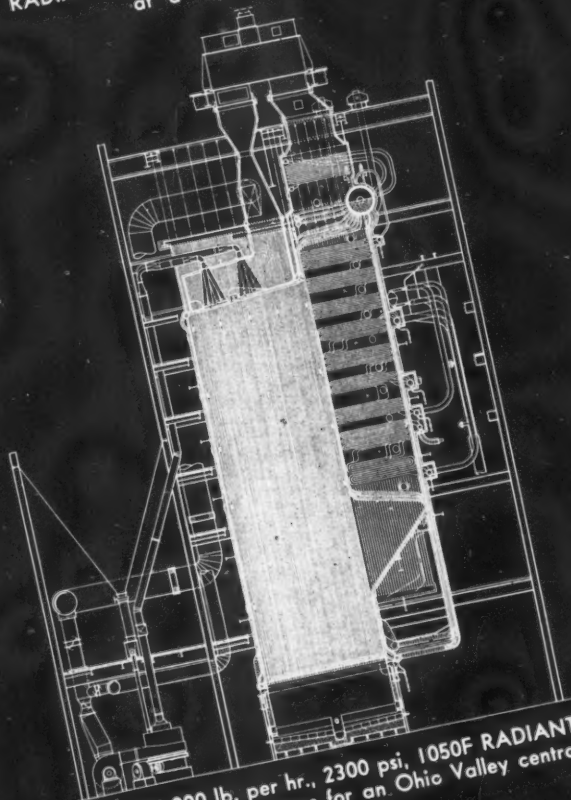
FOR POWER PLANTS — B&W, Open-Pass, Radiant, Integral-Furnace, Cross-Drum, Stirling and Waste-Heat Stationary Boilers . . . Air Multifuel Burners . . . Chain-Grate Stokers . . . Stacks and Breechings . . . Seamless & Welded Tubes for All Pressure and Mechanical



Four 517,500 lb. per hr., 1550 psi, 960F oil and gas fired RADIANT BOILERS of this type for outdoor installation at a Pacific Coast central station.



Two 600,000 lb. per hr., 925 psi, 900F RADIANT BOILERS of this type for a midwestern central station.



Four 930,000 lb. per hr., 2300 psi, 1050F RADIANT BOILERS with reheaters for an Ohio Valley central station.

900,000 lb. per hr., 1250 psi, 900F RADIANT BOILERS for an eastern central station.

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General Offices: 85 Liberty St., New York 6, N. Y.
Works: Alliance and Barberton, O.; Augusta, Ga.

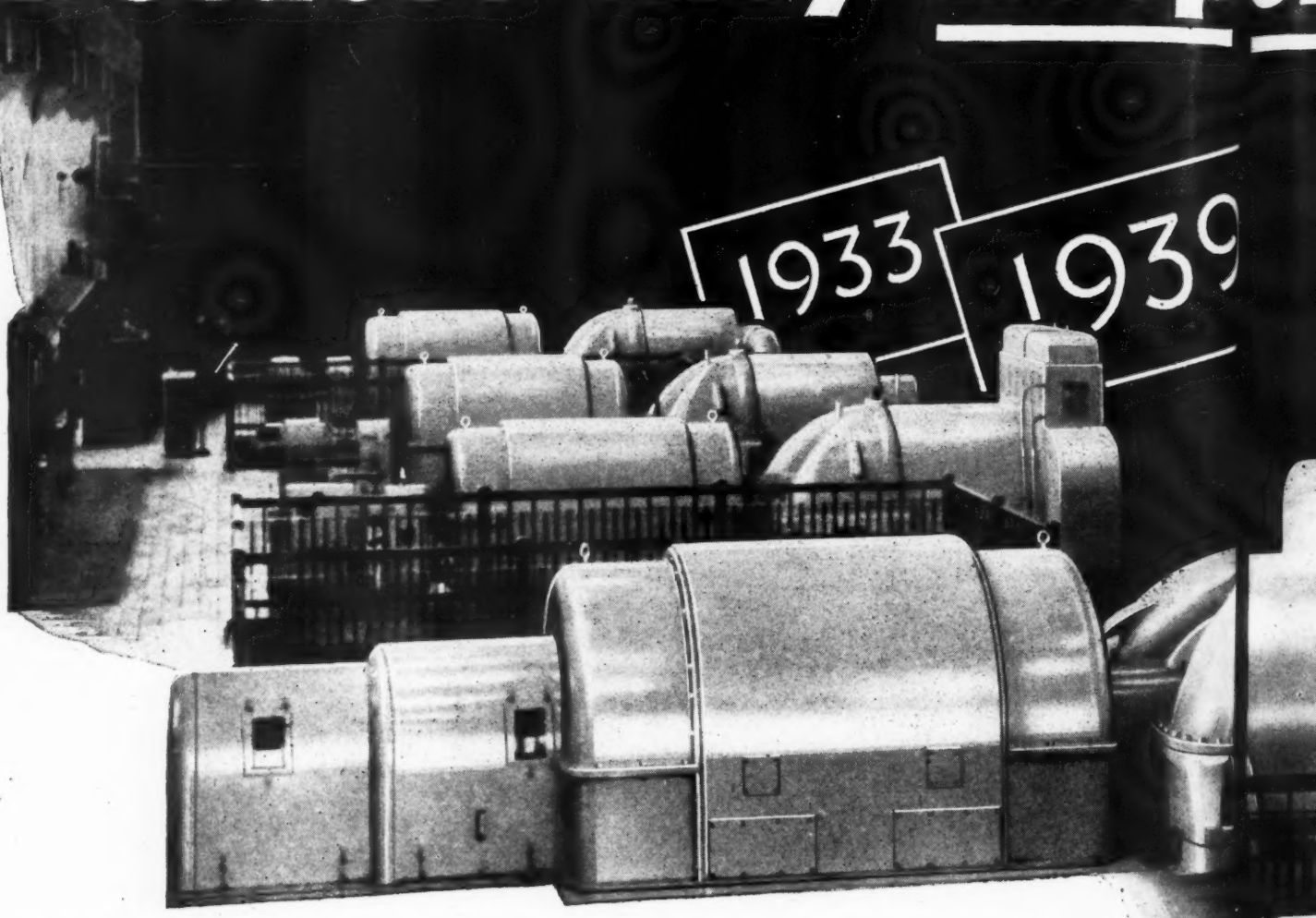
G-408T

BABCOCK & WILCOX

Heaters . . . Economizers . . . Superheaters . . . Water-Cooled Furnaces . . . Oil, Gas & Applications . . . Refractories . . . Chemical Recovery Units . . . Alloy Castings.

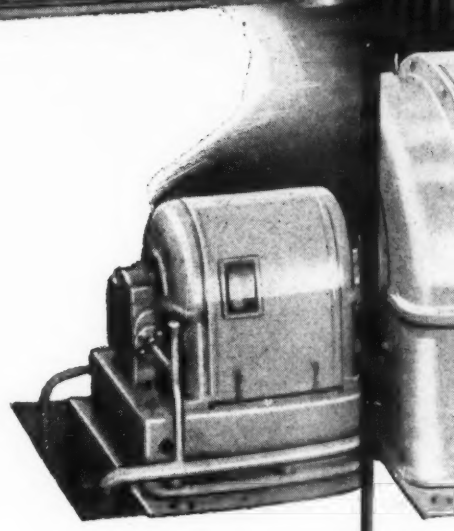
OTHER B&W PRODUCTS—Marine Boilers . . . Pressure Vessels . . . Process Equipment.

Because they keep o



CONFIDENCE like history, repeats itself — when it is soundly based. In this Ohio utility plant, the first two Elliott 4000-kw turbine-generators, installed in 1933, definitely made good. On the basis of their performance, another 4000-kw Elliott unit was installed in 1939. And now, in 1948, two more units are bringing the power output up to the 24-hour per day demands of a thriving and growing industrial community.

The latest installations are a 7500-kw unit, served by an Elliott condenser, and a 1000-kw noncondensing unit, which was installed to supply industrial process steam, or for use as a station house turbine. The entire installation is one of which any manufacturer could be proud.



For full details and descriptive bulletins, address TECHNICAL DATA DEPT.,

Elliott

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H-719

COMPANY

Steam Turbine Dept.

JEANNETTE, PA.

Plants at: JEANNETTE, PA. • RIDGWAY, PA.
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DISTRICT OFFICES IN PRINCIPAL CITIES

STEAM TURBINES • GENERATORS • MOTORS • CONDENSERS
FEEDWATER HEATERS AND DEAERATORS • STEAM JET EJECTORS
CENTRIFUGAL BLOWERS • TURBOCHARGERS FOR DIESEL ENGINES
EXPANDERS • TUBE CLEANERS • STRAINERS • FILTERS

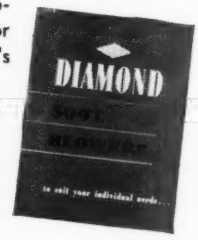
DIAMOND AUTOMATIC OPERATION eliminates the "HUMAN VARIABLE" from the soot blower equation

The human variable in the soot blower equation can often cost money and cause trouble. If some of the blowers are missed or incorrectly operated, the boiler efficiency can be seriously impaired and damage may result.

Diamond Automatic Operation eliminates the human variable from boiler cleaning. None of the blowers can be missed or incorrectly operated because pushing a button or pulling a control starts an automatic sequence which follows through a predetermined cycle to completion. Each blower is operated in turn . . . operated exactly right.

You do not have to try to train an operator to a rigid routine—do not have to provide constant supervision. You *know* your boilers will always be cleaned completely and correctly.

Diamond Automatic Operation is available with air or steam blowing, or both. One blowing sequence is set up to include all blowers . . . in boiler, superheater and economizer. It saves time, too . . . after the operator simply pushes the botton or pulls the control, he's free for other duties.



Write for Bulletin 1014

Beginning on Page 4 is a detailed description of Diamond Automatic Sequential Soot Blowing and its many advantages.

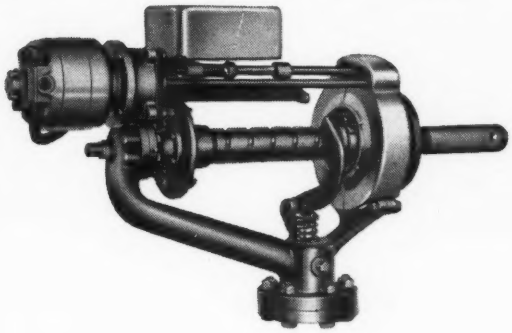
DIAMOND Electric Control Panel

For automatic operation of any number of units individually or in groups. Operator simply presses one "start" button to begin the predetermined cleaning cycle. Light signals show units in operation and where cleaning has been completed.

DIAMOND Air Control Panel

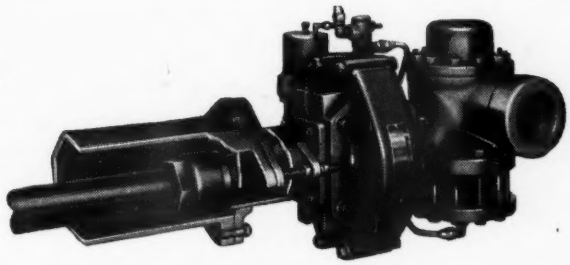
To start the automatic cleaning cycle of any arrangement of the various types of blowers, operator simply moves start and stop valve carrier to its down position, opening main control valve. Travelling upward it operates each selected unit or group in turn. When the last unit has completed its cycle, carrier moves to top of slot and closes valve. There are no electrical connections whatever on this panel.

DIAMOND Model IR
Short Retracting Soot Blower

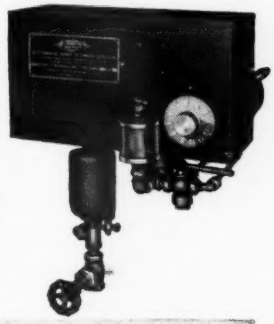


For cleaning either furnace walls or boiler heating surfaces where gas temperatures exceed limit for permanently installed units. Equally applicable to compressed air or steam as the cleaning medium. Manual, air, or electric operation. Advantages include: positive poppet type valve, 12" nozzle travel, no lubrication, simple construction, compact, exceptional durability, etc.

DIAMOND Model A2E
Automatic Air Puff Soot Blower



Automatically cleans heating surfaces by means of a series of compressed air puffs delivered through a standard multiple nozzle blowing element. During the puff—when air is blowing—the element is automatically rotated through a small arc; sufficient puffs are provided to complete blowing arc. Spreading cleaning over longer period permits use of a much smaller compressor and receiver—eliminates upset operating conditions—expels soot in small quantities.



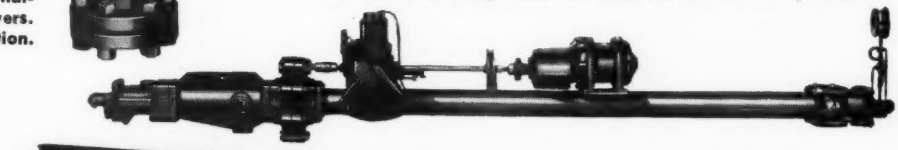
The Air Puff Master Controller automatically controls the blowing operation of all the A2E units to which it is connected. The operator simply opens one valve . . . the controller does the rest: controls puff duration and interval, regulates element rotation, opens and closes air valve in head, determines sequence.

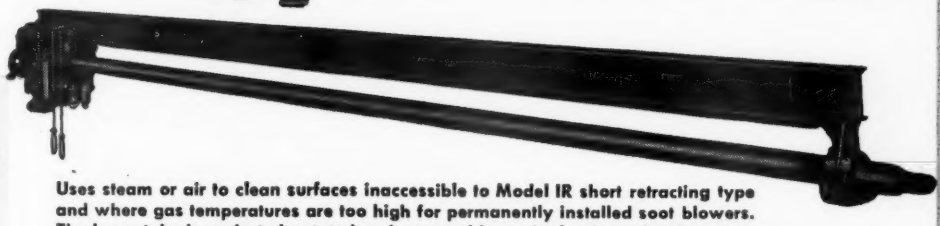
DIAMOND Model G9B
Steam Soot Blower

Employs steam as the cleaning medium through multiple nozzle, permanently installed element. Automatic valved—it goes through a complete operating cycle as the single chain is pulled. Cam and trigger operation of durable poppet valve saves up to 50% of steam used by oscillating valve in head blowers. Manual, air or electric operation.

DIAMOND Telescopic
Long Retracting Soot Blower

Used where insufficient clear space outside boiler will not permit installation of Model IK retracting blower for cleaning surfaces inaccessible to short retracting blower and where gas temperatures are too high for permanently installed units. Uses air or steam as cleaning medium. Either electric or air operation.



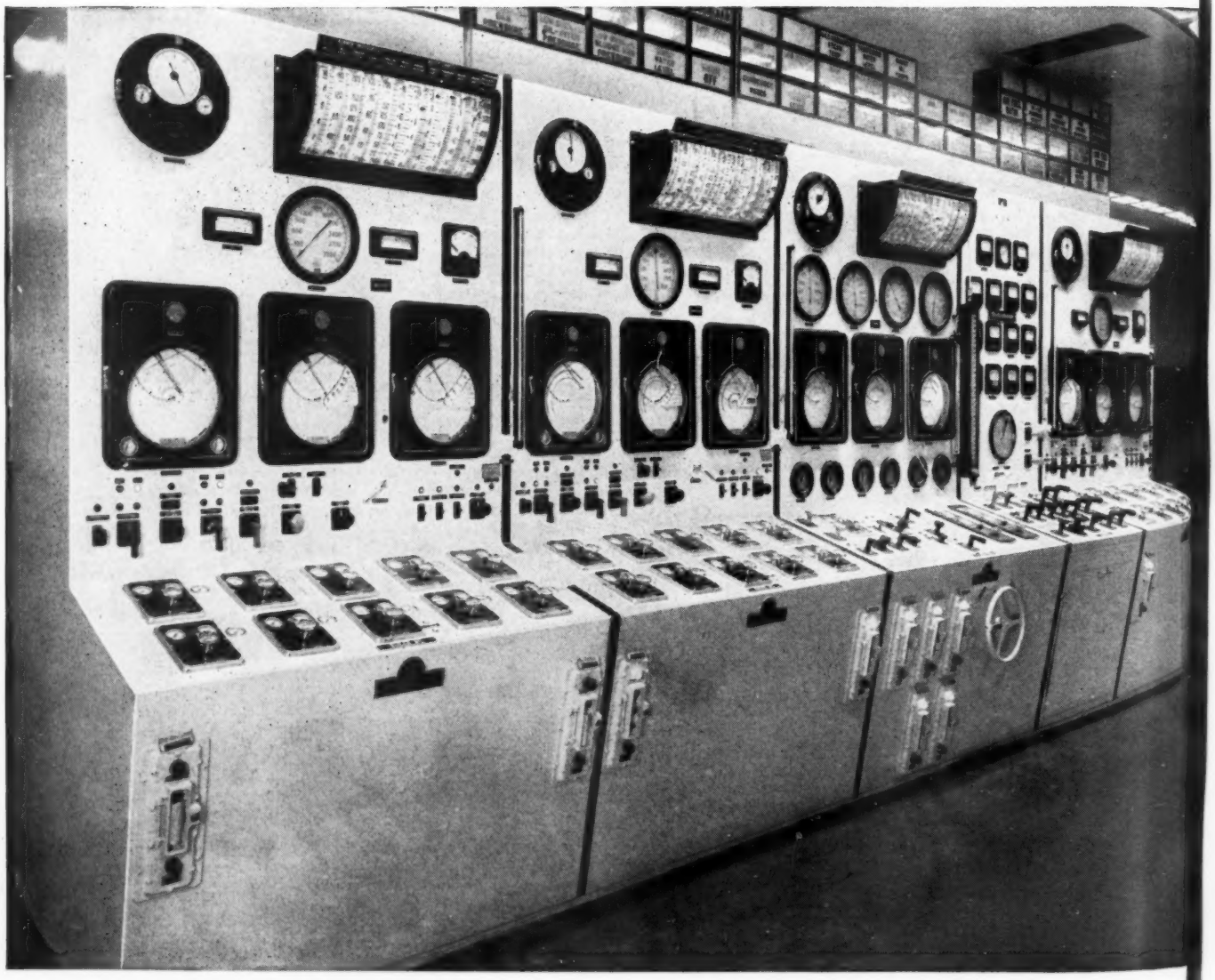


DIAMOND Model IK Long Retracting Soot Blower

Uses steam or air to clean surfaces inaccessible to Model IR short retracting type and where gas temperatures are too high for permanently installed soot blowers. The lance tube is projected, rotated and retracted by a single air or electric motor. Three standard sizes have travels of 10', 12' and 16'; also special travels up to 20'.

DIAMOND POWER SPECIALTY CORPORATION
DETROIT 31, MICHIGAN
DIAMOND SPECIALTY LIMITED — Windsor, Ontario

put your Btu's



Bailey Boiler Panel for a co-ordinated system of Combustion, Feed Water and Steam Temperature Control on three 1500 psi, 950 F, 200,000 lb. per hour gas and oil-fired boilers.

Branches in: Boston, New York, Schenectady, Philadelphia, Buffalo, Pittsburgh, Cleveland, Detroit, Cincinnati, Atlanta;

in shirtsleeves

You can't have low power costs unless the Btu's you feed your boiler roll up their sleeves and go to work. They all won't anyway. The job to do is to put as many to work as possible. Then you get low power costs. And that is exactly what the Bailey co-ordinated boiler control system is designed to do.

This system reduces fuel consumption per pound of steam generated. Combustion, feed water, steam temperature, heater levels, pump speeds and all other factors are co-ordinated. Safety of operation is increased—continuity of service is improved.

You put the maximum number of Btu's to work in power and get all the efficiency your boiler was designed to deliver.

But remember this. The Bailey system is not delivered as a standard package. Each one is designed and engineered to the specific job on which it is to be used. That's why it functions so efficiently.

If you are looking for low cost power, it will pay you to call our nearest office.

BAILEY METER COMPANY
1036 IVANHOE ROAD • CLEVELAND 10, OHIO
BAILEY METER COMPANY LIMITED, MONTREAL

Controls for Steam Plants

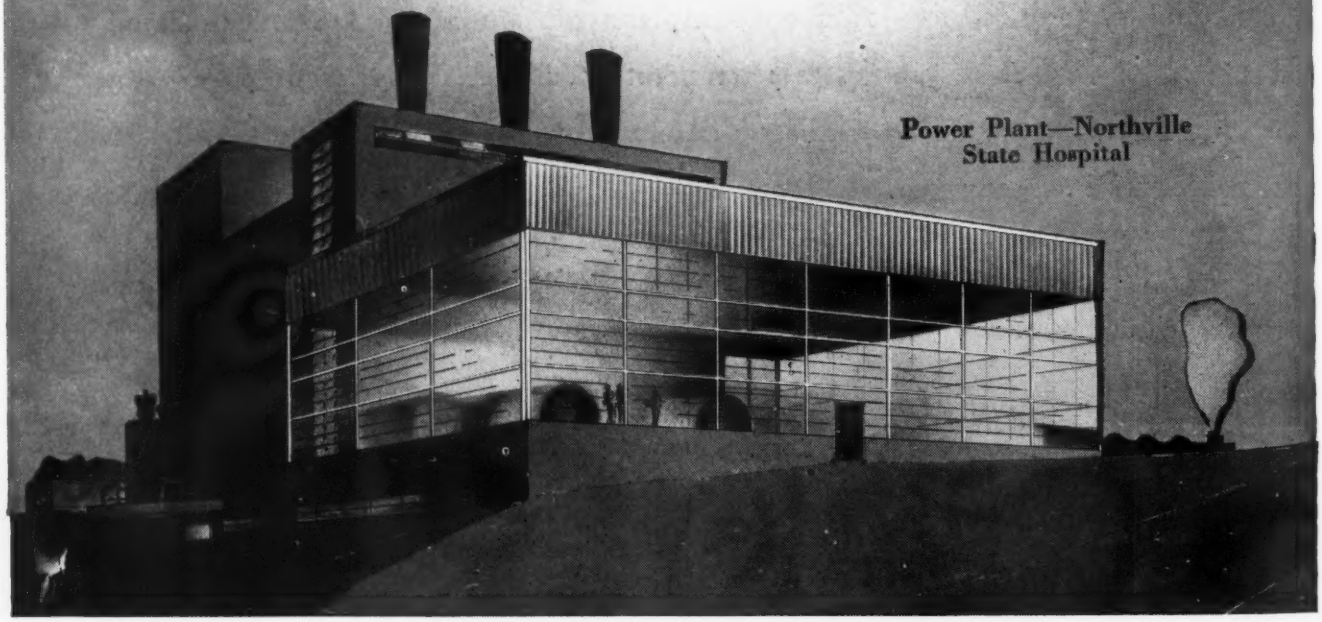
COMBUSTION • FEED WATER • TEMPERATURE
PRESSURE • LIQUID LEVEL • FEED PUMPS

A-103-2

Chicago, Milwaukee, St. Louis, New Orleans, St. Paul, Kansas City, Houston, Denver, Los Angeles, Seattle, San Francisco

the State of Michigan
FUTURE WITH A PROGRESSIVE

Under the guiding hand of ADRIAN N. LANGUIS, *Director of Buildings and Construction, the State of Michigan has embarked on an extensive construction program. As modern and practical as the power plants in which they are installed, Wickes 3-drum Boiler Units have been purchased for power plants at Northville State Hospital and Michigan Reformatory (Ionia), engineered by E. R. Little Co., Inc., Detroit, Mich.; the Kalamazoo State Hospital, by Fargo Engineering Co., Jackson, Mich.; the Traverse City State Hospital and Michigan State Sanatorium (Howell) by Allied Engineers, Inc., Detroit, Mich.; the Northern Michigan College of Education, (Marquette), by Cummins and Barnard, Ann Arbor, Mich.; and Ionia State Hospital, by Beyster Corporation, Detroit, Mich. Scores of Wickes boilers are in successful operation today in state institutions, municipalities and federal projects. Wickes can fill your requirements for boiler units ranging up to 275,000 lbs. steam per hour and 850 p.s.i. Write today.*



Power Plant—Northville State Hospital

THE WICKES

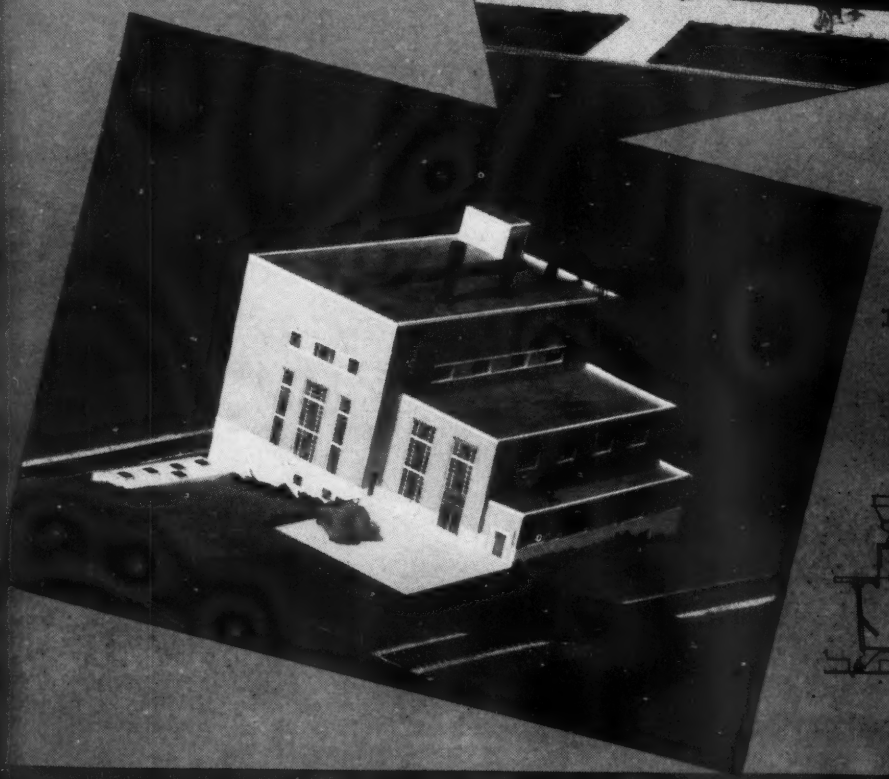
RECOGNIZED QUALITY SINCE 1854

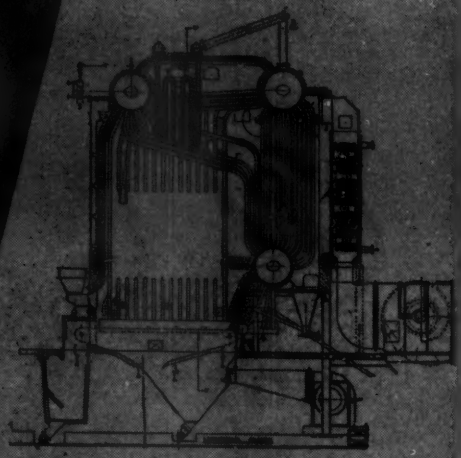
BUILDS FOR THE PRESENT AND CONSTRUCTION PROGRAM

Two Modern Steam Generation Plants

Right: Michigan State Sanatorium, Howell, Mich.

Below: Traverse City State Hospital.





BOILER CO.

Division of The Wickes Corporation

SAGINAW, MICHIGAN

SALES OFFICES: Atlanta • Boston • Charlotte, N. C. • Chicago • Cincinnati • Denver • Detroit • Houston • Indianapolis • Kansas City • Los Angeles • Milwaukee • New York City • Pittsburgh • San Francisco • San Jose, Calif. • Seattle • St. Louis • Tulsa • Mexico City, Mexico • Buenos Aires

HERE'S PROOF

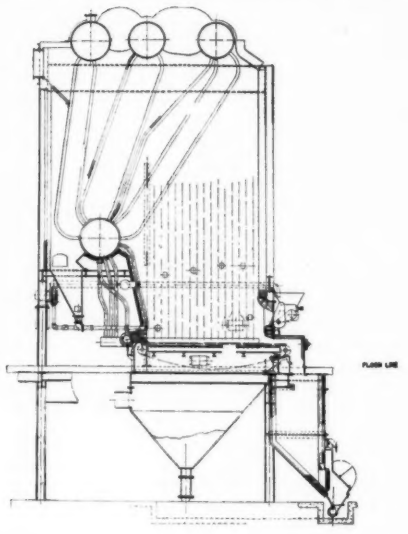
of Æ Perfect Spread Stoker's PERFORMANCE! DEPENDABILITY! LOW-COST OPERATION!

Recognized for over 19 years as a highly efficient, economical stoker, the Perfect Spread Stoker is backed by American Engineering Company's 44 years of combustion engineering experience. Check the recent contracts listed below and write to us today for the names of other industrial and commercial plants which have purchased Æ Perfect Spread Stokers . . . to get more steam at lower cost.

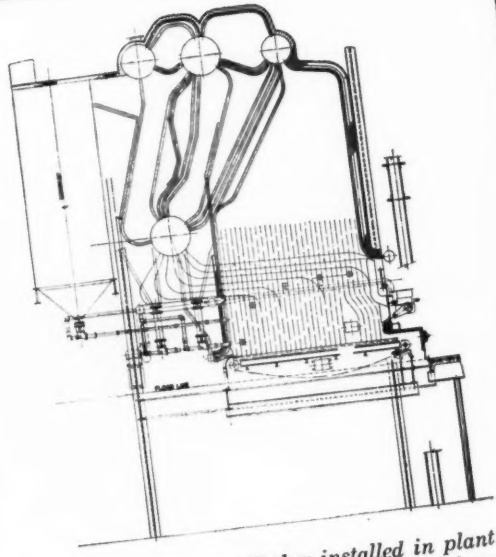
SOME RECENT CONTRACTS FOR Æ PERFECT SPREAD STOKERS WITH CONTINUOUS ASH DISCHARGE

4 units	70,000 lb./hr. each—	*Flint, Michigan*
2 units	60,000 lb./hr. each—	*Saginaw, Michigan*
4 units	80,000 lb./hr. each—	*Cleveland, Ohio*
2 units	180,000 lb./hr. each—	*Pontiac, Michigan*
2 units	60,000 lb./hr. each—	*Kalamazoo, Michigan*
1 unit	60,000 lb./hr. —	*Oaks, Pennsylvania*
2 units	38,500 lb./hr. each—	*Marion, Ohio*
2 units	70,000 lb./hr. each—	*Long Island City, New York*
1 unit	30,000 lb./hr. —	*Indianapolis, Indiana*
1 unit	70,000 lb./hr. —	*Lock Haven, Pennsylvania*

YOU CAN HAVE WITH AN



Æ Perfect Spread Stoker installed in Michigan plant of large automobile manufacturer. Four units 70,000 lb/hr. capacity. Installed under Wickes Boilers.



Æ Perfect Spread Stoker installed in plant of large manufacturing plant in Michigan • Two units 21'0" by 17'3" installed under B&W boilers. Capacity each 180,000 lb/hr.

A PRODUCT OF

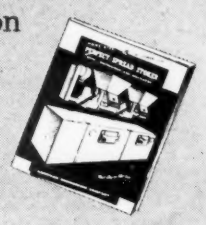
MORE STEAM AT LOWER COST—AUTOMATICALLY

Æ PERFECT SPREAD STOKER

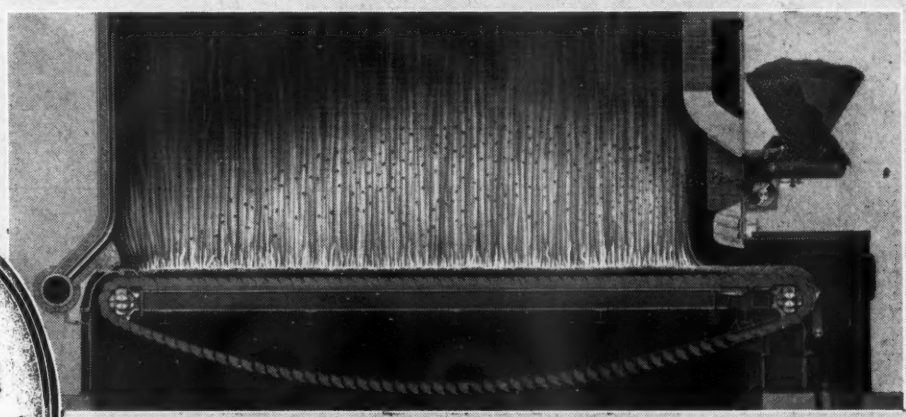
(CONTINUOUS ASH DISCHARGE)

Even using the lowest grades of solid fuels you can get more steam . . . at lower cost, with the new, improved, streamlined Æ Perfect Spread Stoker. It operates perfectly feeding wet, dry, or partially frozen coal or solid fuel . . . without clogging . . . an exclusive Æ Perfect Spread feature. Fuel is spread evenly over the grate and a perfect bed maintained by the unique Æ fuel distributing overthrow rotor. Ashes are removed completely automatically by the traveling grate which handles high or low ash fuels with equal ease.

If you want real freedom from fuel worries and maintenance problems, and if you want more steam at lower cost *now;* it will pay you to send for the Æ Perfect Stoker Bulletin. Leading power plants throughout the nation are installing Æ Perfect Spread Stokers (some recent contracts are listed in this ad). Act now to save fuel, and end high cost steam production —write for more information today.



FREE—Send for this informative bulletin now.



The Æ Perfect Spread Stoker—for requirements from 40,000 to 200,000 lbs. of steam per hour and upwards.*

*Dumping grates for smaller capacities

Won't Clog on Wet Coal!

PERFECT SPREAD STOKER

WITH CONTINUOUS ASH DISCHARGE

Also Available with Stationary and Dumping Grates

AMERICAN ENGINEERING COMPANY

2400 ARAMINGO AVENUE • PHILADELPHIA 25, PENNA.

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IN CANADA—*Affiliated Engineering Corporations Limited, Montreal and Toronto*

OTHER Æ PRODUCTS

- Taylor Stokers
- Lo-Hed Electric Hoists and Car Puller
- Marine Deck Auxiliaries
- Hele-Shaw Fluid Power

FOR MAXIMUM

...in the use of fuels

the Hagan Differential Master System of Automatic Combustion Control

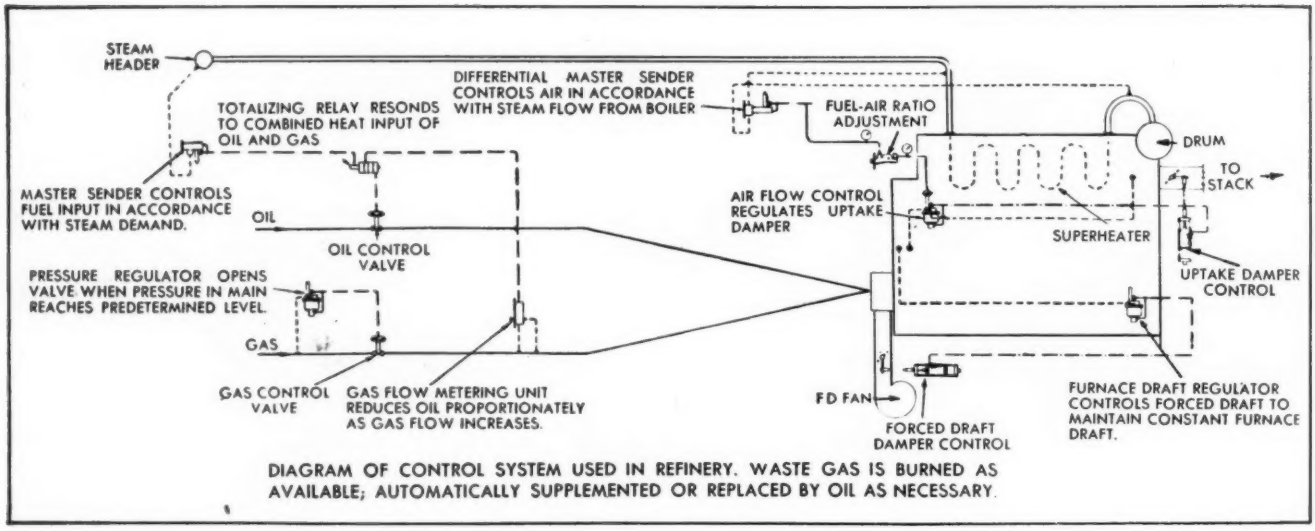

STEAM HEADER
TOTALIZING RELAY RESONDS TO COMBINED HEAT INPUT OF OIL AND GAS
DIFFERENTIAL MASTER SENDER CONTROLS AIR IN ACCORDANCE WITH STEAM FLOW FROM BOILER
FUEL-AIR RATIO ADJUSTMENT
DRUM
TO STACK
MASTER SENDER CONTROLS FUEL INPUT IN ACCORDANCE WITH STEAM DEMAND.
OIL
OIL CONTROL VALVE
AIR FLOW CONTROL REGULATES UPTAKE DAMPER
SUPERHEATER
UPTAKE DAMPER CONTROL
PRESSURE REGULATOR OPENS VALVE WHEN PRESSURE IN MAIN REACHES PREDETERMINED LEVEL.
GAS
GAS CONTROL VALVE
GAS FLOW METERING UNIT REDUCES OIL PROPORTIONATELY AS GAS FLOW INCREASES.
FD FAN
FORCED DRAFT DAMPER CONTROL
FURNACE DRAFT REGULATOR CONTROLS FORCED DRAFT TO MAINTAIN CONSTANT FURNACE DRAFT.

DIAGRAM OF CONTROL SYSTEM USED IN REFINERY. WASTE GAS IS BURNED AS AVAILABLE; AUTOMATICALLY SUPPLEMENTED OR REPLACED BY OIL AS NECESSARY.

The key to maximum flexibility in the use of fuels is the Hagan Differential Master system of automatic combustion control.

With this system, excess air is correctly and automatically controlled at all times. You can burn gas, oil, coal or any combination of these fuels; the B.t.u. value of each may fluctuate; coal may be dry or wet, but the proper air ratio for most efficient operation is maintained.

This is accomplished simply and directly. A *Master Sender*, sensitive to steam header pressure, controls the rate of fuel feed so that B.t.u. input is in accordance with demand. A *Differential Master Sender*, measuring steam flow, regulates air flow.

Each of these units has its own function, and performs that function *directly*.

The rate of fuel feed is changed instantly to compensate for any change in steam demand, for any fluctuation in calorific value of fuel, or for any variation in feeder characteristic.

Air, however, is changed *only when there is an actual change in heat* input to the furnace, as shown by a change in steam flow.

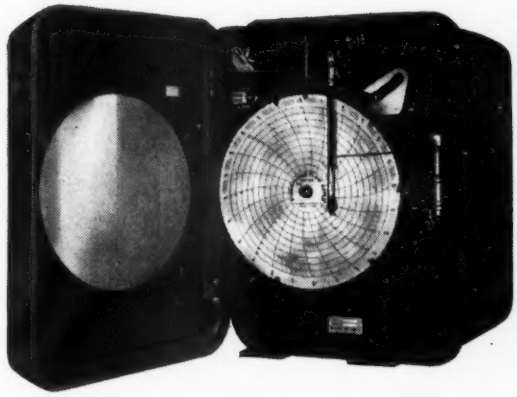
The Hagan Differential Master system will help you meet changing fuel situations in the future—and right now it will give you better control of combustion and substantial fuel savings.

flexibility

...in metering

Hagan Ring Balance Flow Meters

These meters will measure gas, air, water, steam and other fluids—and the differential head capacity for a given meter is exactly the same in any of these services. Readjustment for any differential head between 20 and 140 inches water column is merely a matter of adjusting the range screw. Ring assemblies may be changed to provide differentials outside this range—and this change can be made readily without removing the meter case from its mounting.



Our engineers will be glad to give full information on Hagan Combustion Control Systems or Hagan Ring Balance Flow Meters.

HAGAN
HALL
BUROMIN
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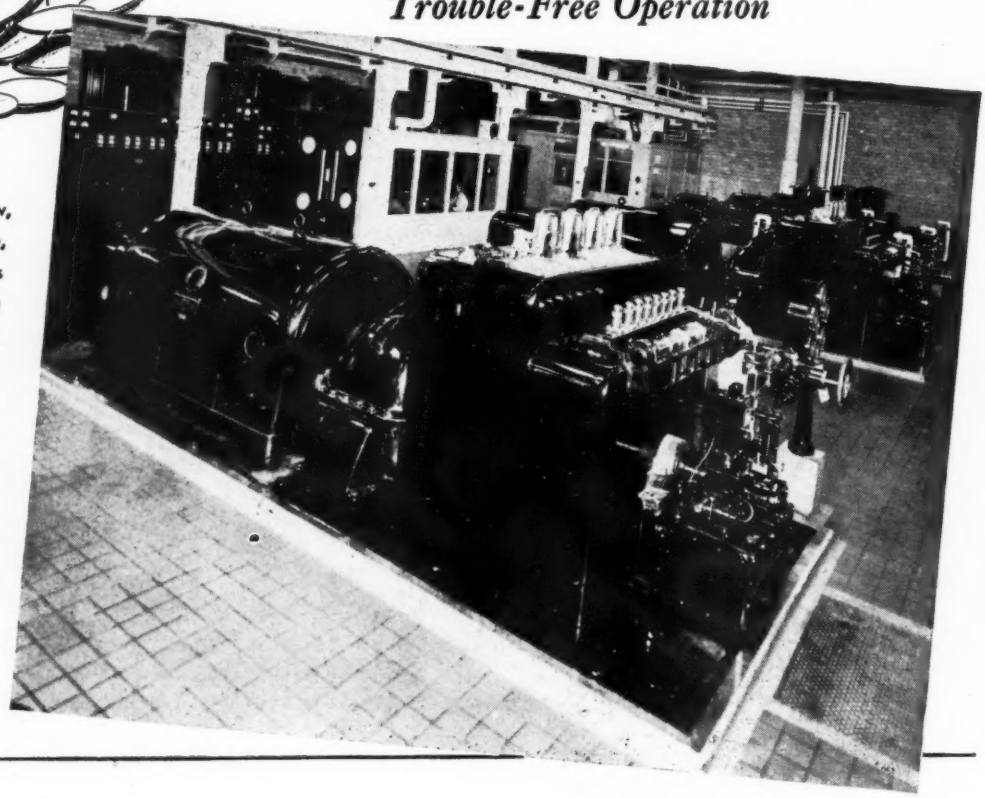
HAGAN CORPORATION

HAGAN BUILDING, PITTSBURGH 30, PA.

BOILER COMBUSTION CONTROL SYSTEMS
RING BALANCE FLOW AND PRESSURE INSTRUMENTS
METALLURGICAL FURNACE CONTROL SYSTEMS
THRUSTORQ FORCE MEASURING DEVICES

COST-CUTTERS YOU CAN DEPEND ON!

Worthington Turbine-Generators Set The Pace For Economical, Trouble-Free Operation



Two Worthington 2500 kw, 3600 rpm, 13,800 volt, 3-phase, 60 cycle Turbine-Generator Units at the Kaiser-Frazer plant in Willow Run, Michigan. They operate on steam at 250 lb. initial pressure, 470° F. total temperature, and exhaust at 27½" vacuum. Steam is automatically extracted at pressures from 15-50 lb. Installed in 1941, these Worthington Units supply both electric power and extracted steam for plant heating.

Worthington builds Turbine-Generator Sets in sizes up to 7500 kw, and in all types—including straight condensing, straight non-condensing, extraction, mixed pressure, mixed pressure extraction, low pressure and high back pressure.

Throughout industry these units are generating lower cost power, requiring only minimum maintenance, chalking up records of 99% — and better—for continuous operation, year after year.

IN YOUR OWN PLANT

Worthington engineers will be glad to study your power requirements, and to give you an estimate of the savings possible with the Worthington Unit that best meets your particular needs.

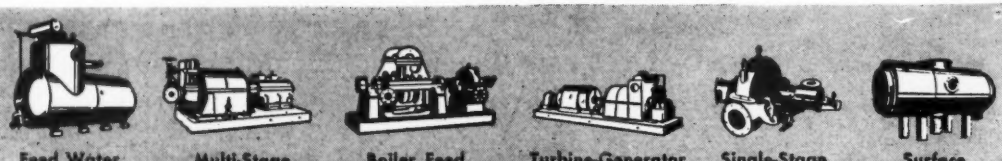
For further details proving *there's more worth in Worthington*, call your nearest Worthington District Office, or write to *Worthington Pump and Machinery Corporation, Steam Turbine Division, Wellsville, N. Y.*

WORTHINGTON

Steam Turbines

T8-2

A GREAT TEAM IN STEAM



20,000

1884 1948

A RED-LETTER DAY 64 YEARS IN THE MAKING

On August 17, stoker sales of Combustion Engineering and its predecessor companies totalled 20,000 units — an average of more than one stoker *every working day since 1884.*

When you consider that choosing a stoker involves the evaluation of many factors . . . complex factors such as boiler design, fuel characteristics, type of load and the like . . . and when you multiply these variables by 20,000 . . . then only can you realize the breadth of experience which C-E brings to the selection of a stoker exactly suited to your requirements. It is an accumulated experience unmatched by any other manufacturer.

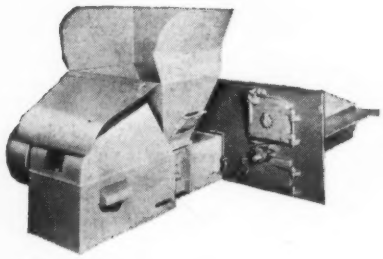
. . . MOREOVER

C·E

COMBUSTION ENGINEERING

C-E has no

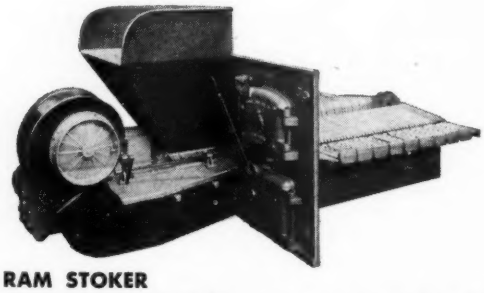
Coupled with C-E's unparalleled breadth of experience is the added advantage of a *complete* line of stokers, which includes every basic type — thus eliminating the possibility of bias, or the need for compromise, in meeting your requirements.



SKELLY STOKER UNIT

Approximate Application Range — 20 to 200 boiler hp.

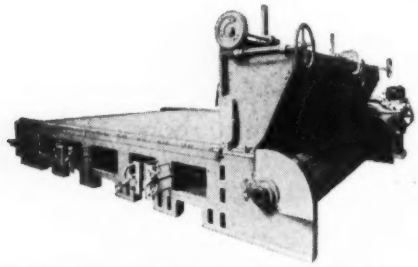
A compact, self-contained underfeed unit available in designs for burning either anthracite or bituminous coal. An alternate arrangement of fixed and moving grate bars assures lateral distribution of fuel and maintains a clean porous fire. Cantilever dump grates of non-avalanching type simplify ash removal. An integral forced-draft fan, with inlet damper control, permits positive regulation of air-coal ratio. Sixteen rates of coal feed through variable-speed transmission. Automatic control is standard equipment. Timken bearing equipped. Alemite lubrication.



LOW RAM STOKER

Approximate Application Range — 35 to 200 boiler hp.

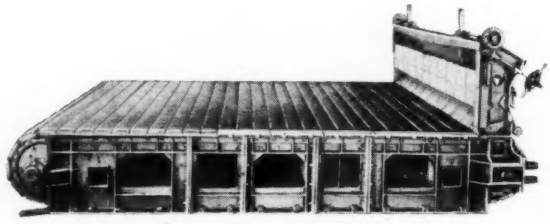
A ram-type underfeed stoker equipped with integral forced-draft fan and drive mechanism. It is designed to burn either free-burning or caking bituminous coals. Since the stoker body is only 16 inches high, the C-E Low Ram Stoker is ideally suited for installation under low-set, water-leg boilers where headroom and furnace volume are limited. Its unit construction assures quick and easy installation at minimum cost. In most applications, it can be set directly on the boiler room floor, requiring no special foundation work.



TRAVELING GRATE STOKERS (Chain Grate)

Approximate Application Range — 150 rated boiler hp. up to largest units suitable for stoker firing.

The chain grate stoker derives its name from the character of its grate surface, which is comprised of small link castings held together by through rods to form a continuous flexible chain. Special driving links, located at intervals across the width of the stoker, engage a series of driving sprockets carried on the front shaft. C-E Chain Grate Stokers include the well-known Green Chain Grates, of which about 4300 have been installed under boilers with an aggregate heating surface of over 10,000,000 sq. ft. C-E Chain Grate Stokers are available in both forced- and natural-draft designs and are well suited to the use of free-burning bituminous coals.



TRAVELING GRATE STOKERS (Bar Grate)

Approximate Application Range — 150 rated boiler hp. up to largest units suitable for stoker firing.

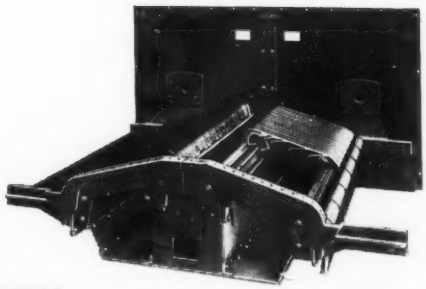
These stokers are of the bar-and-key type, so called to describe the construction of the grate surface. This consists of small castings supported by transversely arranged grate bars carried by sprocket-driven chains. The C-E Coxe Stoker is the most widely known traveling grate in the field, more than 2400 having been installed under boilers with an aggregate heating surface of more than 11,000,000 sq. ft. It has no equal for burning the small sizes of anthracite and coke breeze and is well suited to lignite and some free-burning bituminous coals. C-E bar type traveling grates are forced-draft stokers with the entire grate surface under zoned air control.

C-E

COMBUSTION

C-E PRODUCTS INCLUDE ALL TYPES OF BOILERS, FURNACES, PULVERIZED FUEL SYSTEMS AND STOKERS; ALSO SUPERHEATERS, ECONOMIZERS AND AIR HEATERS

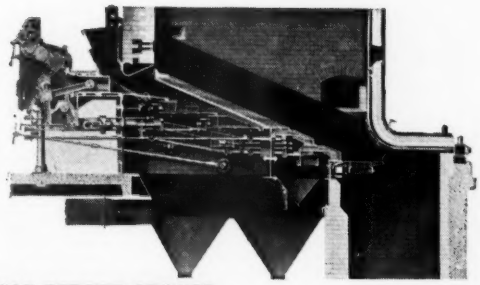
axe to grind



TYPE E STOKER

Approximate Application Range — 150 to 600 boiler hp.

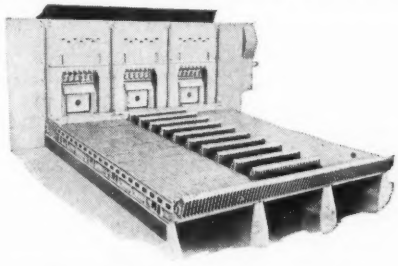
A single-retort, underfeed stoker designed to burn a wide variety of bituminous coals, particularly those having caking and coking characteristics. The Type E has ram type feed supplemented by a reciprocating sliding bottom. Its grate surface consists of hollow, air-cooled grate bars arranged in an alternately fixed and moving relationship to condition the fuel bed and assure its steady movement to the dump trays which are of the cantilever type. Air supply is under zoned control with provision for introduction of air over the fire. Type E Stokers are available with steam, electric or hydraulic drive.



MULTIPLE RETORT STOKER

Approximate Application Range — 500 boiler hp. up to largest units suitable for stoker firing.

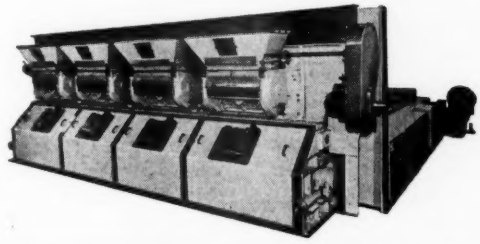
A multiple-retort underfeed stoker designed to burn either caking or free-burning bituminous coals. C-E design has superior features, such as — all controls grouped in front of the stoker, effective sealing against siftings, reciprocating overfeed section, zoned air control, ability to maintain a uniform fire and effective ash discharge. The stroke of the secondary rams and of the overfeed section in each retort is adjustable, as a group or individually. The speed of the main rams and control of the zoned air supply are all conveniently arranged at the stoker front.



SPREADER STOKER (Dumping Grate Type)

Approximate Application Range — 150 boiler hp. up to units producing 150,000 lb of steam per hr, or more.

This simple, rugged stoker is designed to burn a wide variety of coals. Hopper, feeding and distributing mechanism, variable-speed drive and motor are combined in a compact unit. A series of rotating spreader blades feeds coal into the furnace in criss-crossing streams which assure uniform distribution. Fines are burned in suspension and the rest of the coal is burned on the grate. Grate surface is zoned for regulating air admission and to facilitate cleaning. All parts subject to wear are readily accessible for inspection, adjustment or replacement, when necessary. Rate of fuel feed and air supply may be regulated over a wide range and are readily adaptable to automatic control.



SPREADER STOKER (Continuous Discharge Type)

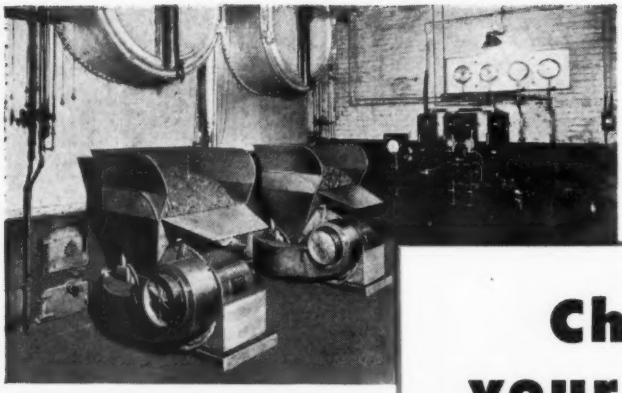
Approximate Application Range — 50,000 lb of steam per hr, or less, to largest units suitable for stoker firing.

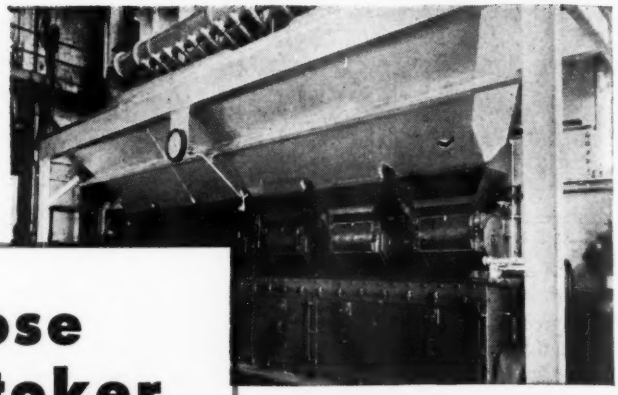
The C-E Continuous Discharge Spreader Stoker is actually two stokers in one. It combines the feeding and distributing advantages which characterize the dumping grate spreader with the smoothly operating, continuous ash disposal achieved by the addition of a traveling grate. This stoker permits the burning of more fuel per foot of furnace width than the dumping grate type, thus extending the advantages of spreader stoker firing to larger boilers. The uniformity of fuel-bed and furnace conditions, plus continuous and automatic scavenging of ash from the fuel bed, simplifies stoker operation and reduces attendant labor to a practical minimum.

...CONSIDER ALSO

ENGINEERING

200 MADISON AVENUE, NEW YORK 16, N. Y.





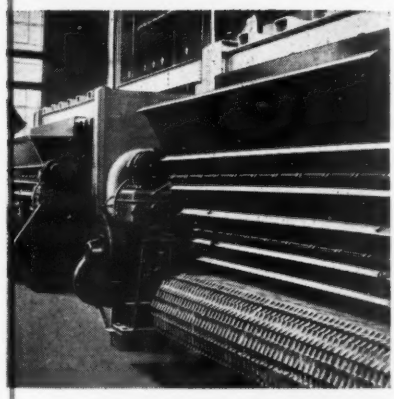
Choose your stoker for the YEARS AHEAD

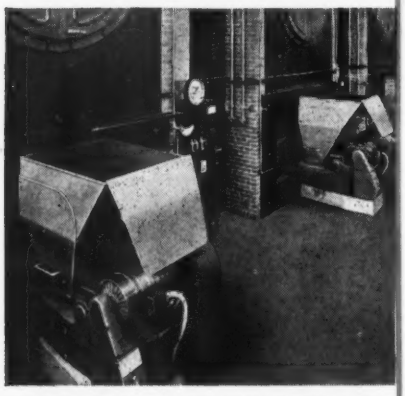
The price you pay for a stoker is only a down payment on the continuing cost incident to steam generation. For example, the cost of fuel burned each and every year throughout the useful life of the equipment far outweighs the original purchase price of the stoker. And, at today's coal prices this fact is of paramount importance to you.

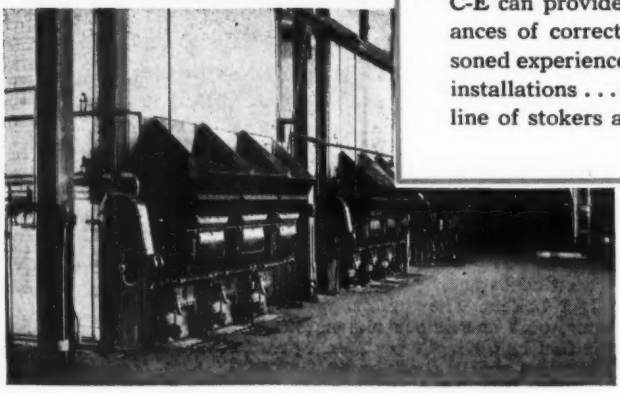
Furthermore, there is no "general purpose" stoker. Each basic type has advantages that are realized fully only when matched with coals of definite characteristics under well-defined operating conditions. How essential it is, then, that you make the correct selection . . . that you avoid the pyramiding costs that inevitably result from improperly selected equipment.

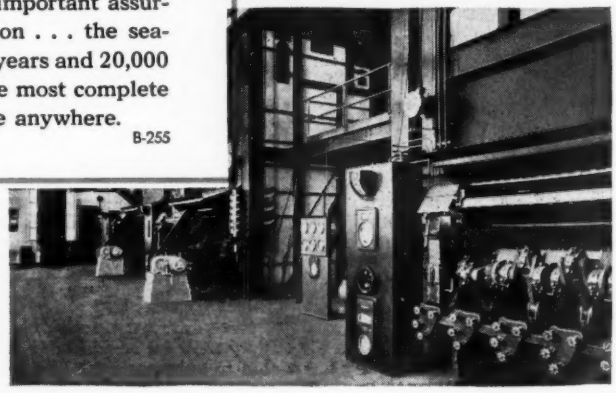
Turn to C-E with confidence, for only C-E can provide these important assurances of correct selection . . . the seasoned experience of 64 years and 20,000 installations . . . plus the most complete line of stokers available anywhere.

B-255









COMBUSTION ENGINEERING

PRODUCT OF THE MONTH

DEPENDABLE

Boiler Feed Pumps

A 6 by 5 in. DL-7-stage Doubleton centrifugal boiler feed pump rated 650 gpm, 1,690 psi, 3,580 rpm pumping 283° F water and driven by a 1,000 hp Allis-Chalmers motor.

OUTSTANDING FEATURES

- **VOLUTE CASING** allows pumps to operate smoothly over a wide range of the head and capacity curve.
- **DOUBLE SUCTION IMPELLERS** allow for a lower net positive suction head (N.P.S.H.).
- **BEST MATERIALS** for specific water conditions are selected for your application — your assurance of getting maximum durability.

MILWAUKEE, WIS. — Advanced design, specialized engineering and finest materials fit Allis-Chalmers boiler feed pumps for reliable, heavy-duty powerhouse service. Added benefit: carefully matched Allis-Chalmers pump-motor "team" means you get assurance of satisfactory unit performance.

BE SURE TO GET an Allis-Chalmers quotation for your next boiler feed pump application. Allis-Chalmers is the only source of pumps *and* motors in *any* type, *any* size. Backed by 60 years of pump building — more than 50 years of service to the electric power industry.

ALLIS-CHALMERS

One of the Big 3 in Electric Power Equipment—Biggest of All in Range of Industrial Products

A 2512

Allis-Chalmers Mfg. Co.
Milwaukee 1, Wis.

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Company.....

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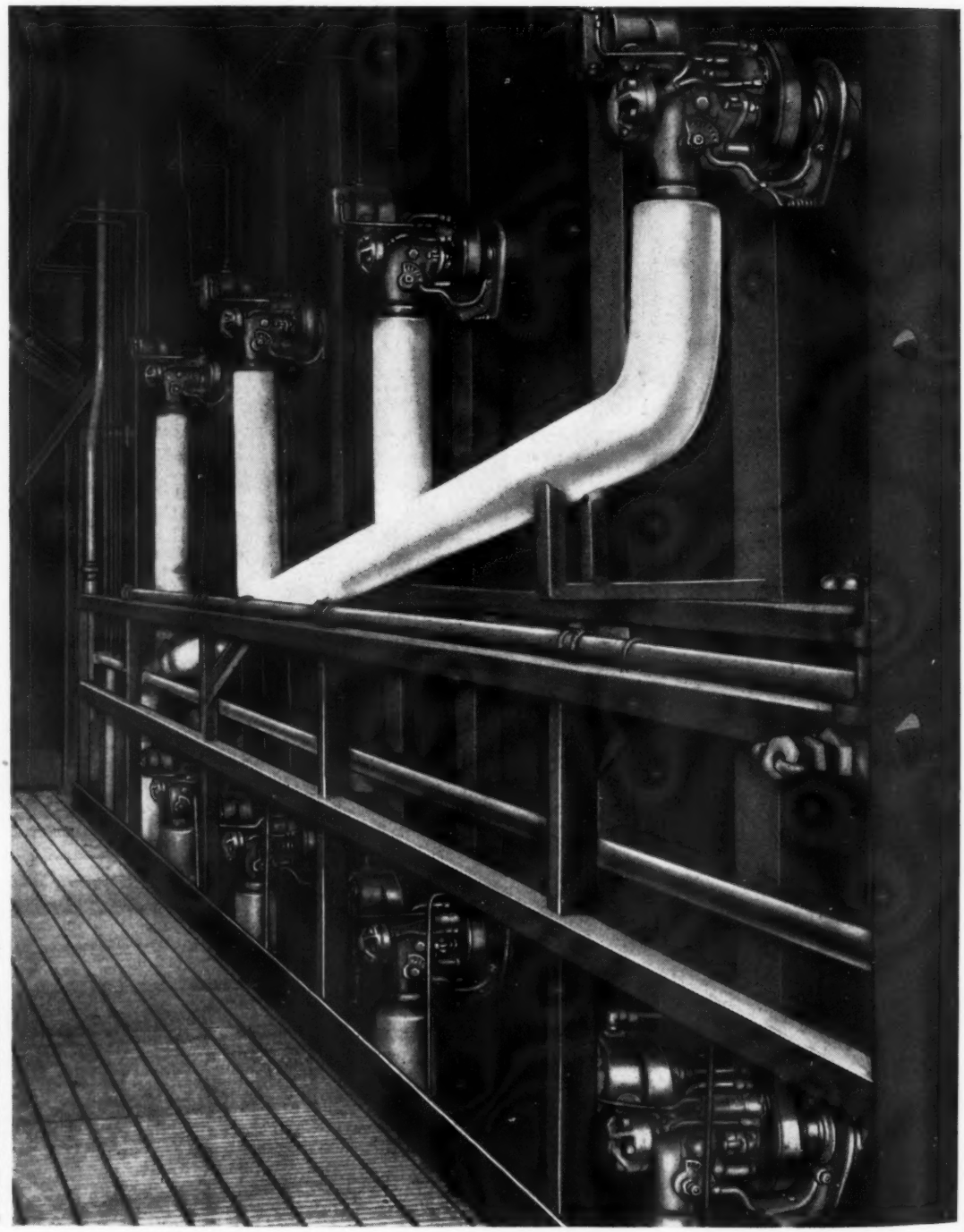
City..... State.....

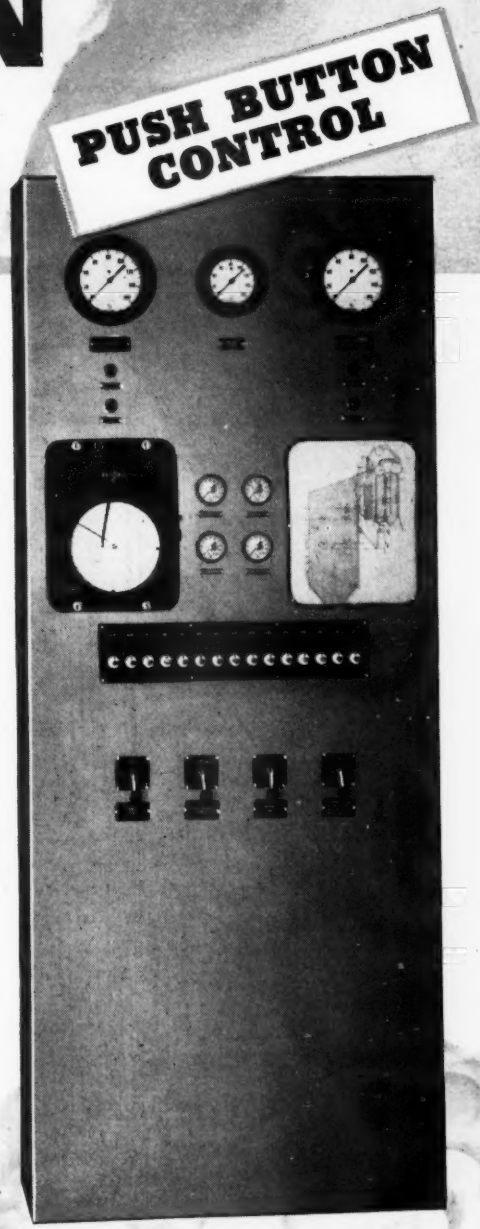
P.

for AUTOMATIC ---by Steam



Sequential Soot Blowing it's VULCAN

Because of Unusual Design and Flexibility



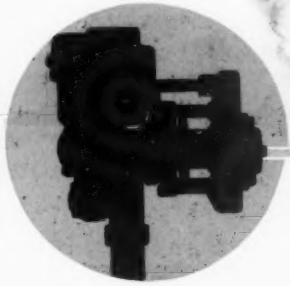
Push one button on the master control panel, and you operate the entire system and shut it down. Blow by groups, if you like. Skip one unit, or a number of units, as you wish. Any combination is possible by a simple turn of control buttons—as easy as that.

But you want to blow with compressed air? Fine! Vulcan air systems are in successful operation on many modern boilers.

More and more engineers now specify Vulcan Automatic Sequential Blowers. Ask us to show you why.

VULCAN SOOT BLOWER CORPORATION
DUBOIS, PENNSYLVANIA

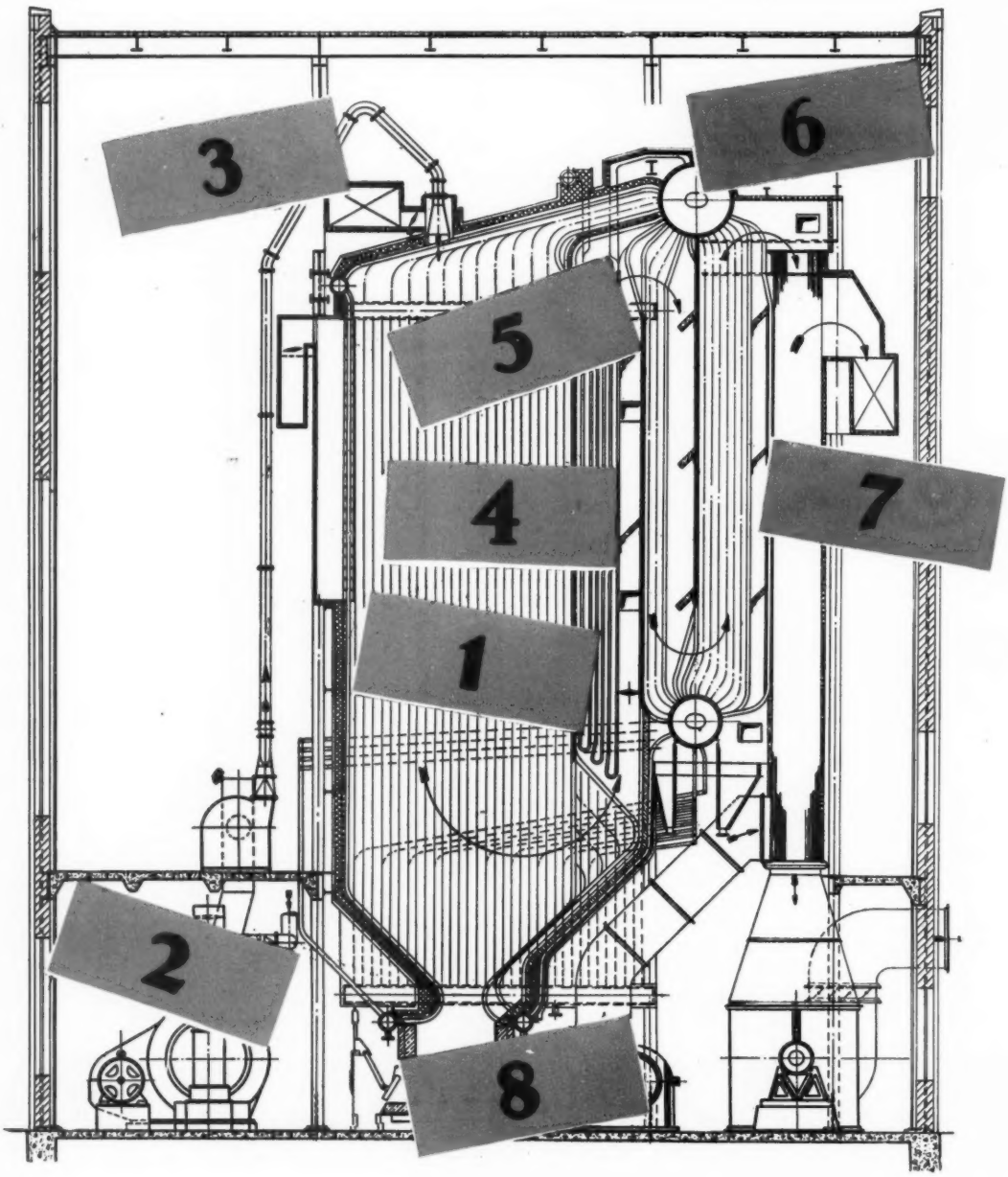
VULCAN
STEAM OR AIR



SOOT BLOWERS

KVS Complete ENGINEERING of S

All Components



STEAM GENERATORS

are designed to meet . . . your operating conditions

1 SHADOW WALLS

KVS design provides for wide range or base load operation on all fuels. Desirable features include low first cost, low maintenance, and ability to maintain a high furnace temperature at low or high ratings resulting in high furnace efficiency.

2 PULVERIZER

Fine pulverization with the KVS Air Swept Tube Mill assures rapid combustion resulting in high operating efficiency. Inasmuch as coal is ground in air, a carbureted fuel is prepared, enabling oxygen and carbon to combine for quicker true radiant combustion.

3 COAL BURNER

Combustion with the KVS Coal Burner results in high furnace temperature on all grades of coal handled. The burner, of either the rotary or vortex type, is low in first cost and maintenance and high in availability. High turbulence completes carburization of the coal.

4 TANGENT TUBE REAR FURNACE WALL

This feature in conjunction with shadow walls eliminates refractory maintenance between furnace and superheater pass. It permits higher furnace temperatures resulting in greater radiant heat transfer and increased furnace efficiency.

5 SUPERHEATER

Control of final superheat temperature is effected either by direct, separately fired, thermostatically controlled design providing high transfer rate by radiation or through the use of a convection superheater situated in the first gas pass and a thermostatically controlled bypass damper. Uniform steam temperatures are assured at all ratings.

6 STEAM PURIFIER

The KVS Cyclone Type Steam Dryer and Purifier separates the steam from the solids and moisture—producing a pure steam. It removes the solids completely from the steam drum. No impurities are permitted to return to the boiler waters. This system operates perfectly with 100% make-up water.

7 PREHEATER

KVS Air Preheaters assure high overall efficiency with low exit gas temperatures. They are of the downdraft gas and cross counterflow air type. Gas passes inside preheater tubes and air outside. Draft loss and pressure drop are minimized. Gases having high sulphur content can be safely handled.

8 DRY BOTTOM FURNACE

The KVS design Dry Bottom Furnace increases radiant heating surface and minimizes hopper maintenance. It provides the means of readily collecting and disposing of hopper ash.

KVS ENGINEERING SERVICE

KVS Steam Generating Equipment has been performance proved over the years. KVS offers a complete service in design, building and erecting complete plants under one responsibility. KVS engineers are available for consultation on your requirements.

Ask for a copy of 97-page Engineering Bulletin No. 44-B containing valuable information on preparation of pulverized fuel and steam generating plants.

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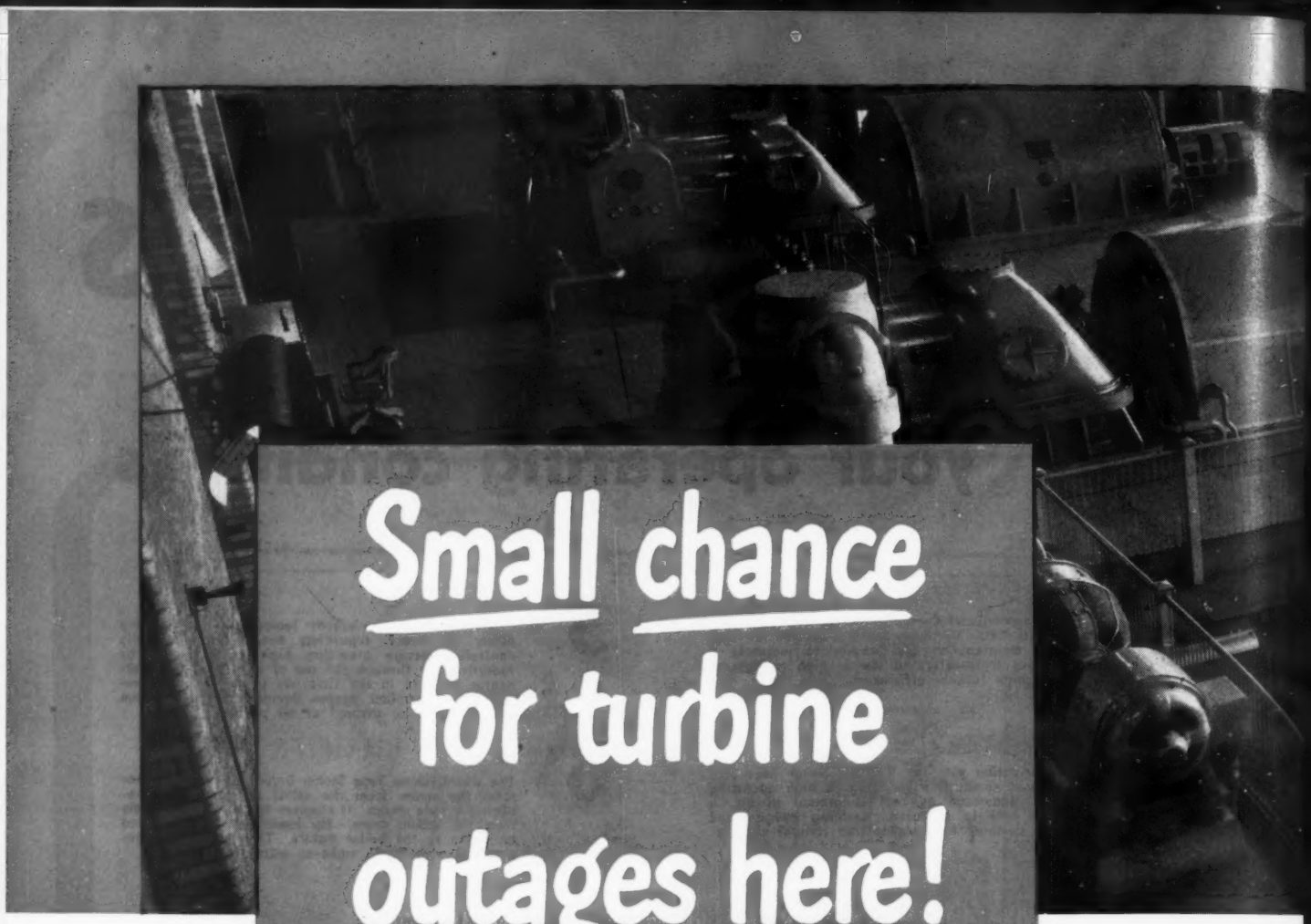


Small chance for turbine outages here!

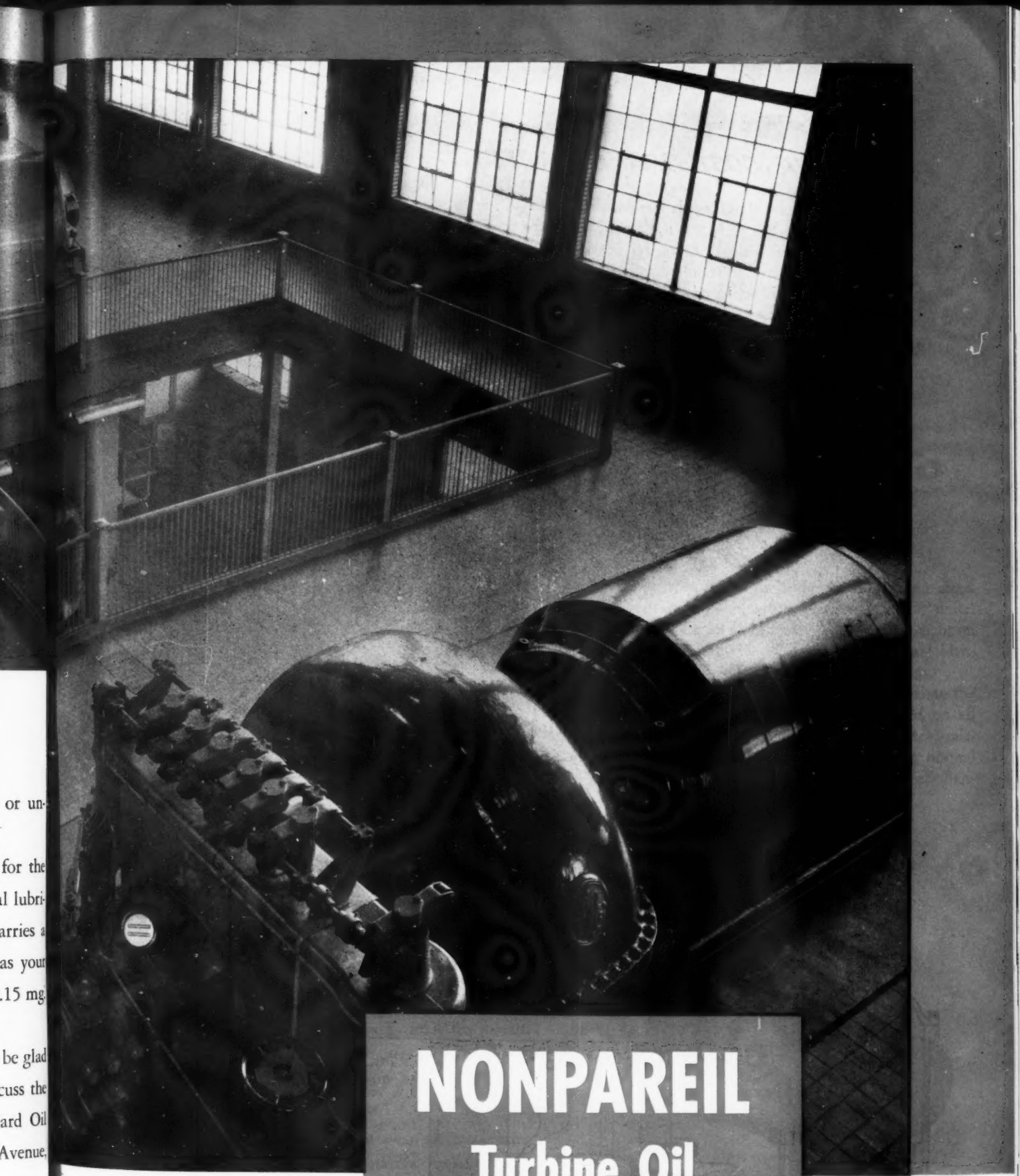
The midwest utility plant, shown in the above photograph, runs little risk of enforced turbine outages because of oil trouble. The 14-year performance record of Nonpareil Turbine Oil at this plant provides the basis for this assurance of safety.

In 1934, Nonpareil was put into one 15,000 KW turbine. A 7,500 KW unit and a second 15,000 KW unit were started on Nonpareil in 1935 and 1941, respectively. The original fills of oil have remained in these turbines for the 7 to 14 years of operation. There has been no deterioration of the lubricant. The oil has not been removed for treating or resting, yet neutralization numbers have stayed below 0.09. There has been no outage time, scheduled or unscheduled, for oil-system maintenance.

Nonpareil assures trouble-free operation for the life of *every* turbine it lubricates. This unusual lubricant is the only product in its field that carries a written guarantee that it will last as long as your turbine without increasing in acidity above 0.15 mg KOH/gm.

A Standard Oil Lubrication Engineer will be glad to show you this written guarantee and discuss the advantages its holds for you. Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

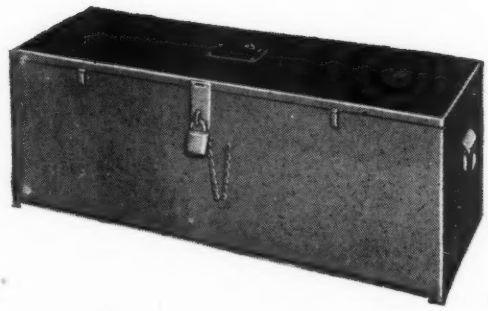
STANDARD OIL COMPANY (INDIANA



TANDARD OIL COMPANY (INDIANA)

STANDARD

FOR LOWER COST SPARE PARTS...

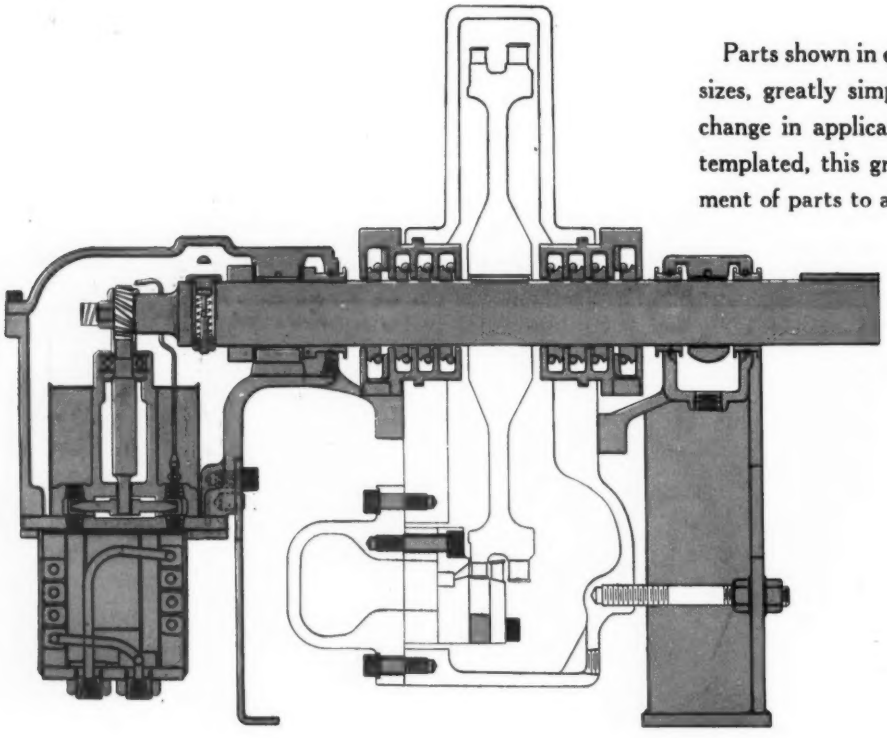


This set of packaged spare parts for the new Type DP turbine line costs you less than 25% of the price of a comparable set of spares for previous G-E small turbines. Greater standardization and improved design make this saving possible.

Best of all is the fact that parts in this standard kit are applicable to *all* Type DP turbines, whether 10 or 1000 hp. This permits you to cut your spare parts inventory drastically, at the same time provide better insurance against shutdowns.

STANDARDIZE

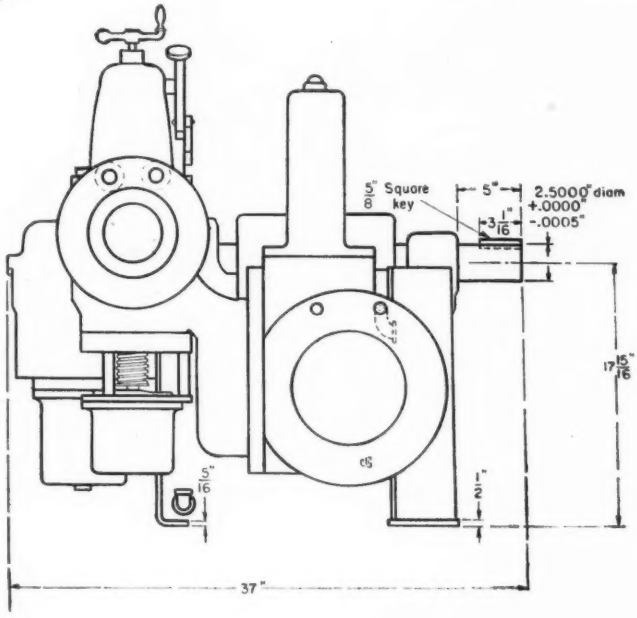
FOR INTERCHANGEABILITY...



Parts shown in color are interchangeable on all frame sizes, greatly simplifying maintenance. Also, where a change in application or rating of a turbine is contemplated, this greater standardization keeps replacement of parts to a minimum.

ON THE NEW STANDARD TURBINES

FOR SIMPLER INSTALLATION...

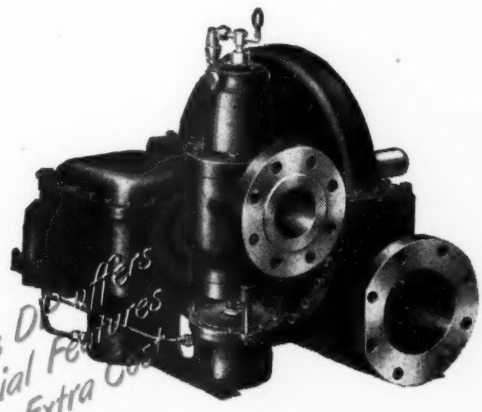


Dimensions shown are common to all frame sizes. For instance, shaft height is the same on all DP units, permitting you to use a standard mounting height on all your turbine drives. Also, all DP shafts are identical, permitting you to use standard couplings.

When it comes to alignment, you'll appreciate the DP's center-line support—now standardized on all frame sizes. Center-line support eliminates misalignment resulting from expansion from normal heating. Once installed, the DP stays in proper alignment—hot or cold.

The greater standardization of the new Type DP line permits us to offer a host of superior design features—all at no extra cost. Price level of the DP line is the same as that of the previous DS line.

For the full story of how these features can mean operating benefits to you, call your G-E representative. Apparatus Department, General Electric Company, Schenectady 5, N. Y.

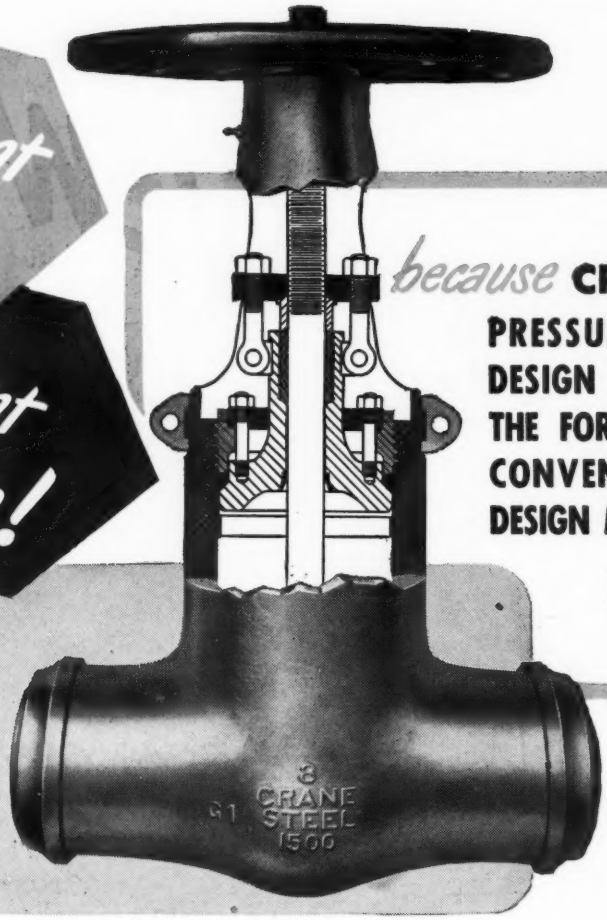


GENERAL ELECTRIC

262-30

No Bonnet Joint Leakage!

No Bonnet Joint Maintenance!



because **CRANE PRESSURE-SEAL DESIGN UTILIZES THE FORCE THAT CONVENTIONAL DESIGN MUST** *fight!*

CRANE
Pressure-Seal Bonnet
VALVES
GATES · GLOBES · ANGLES · STOP-CHECKS
FOR HIGH-PRESSURE, HIGH-TEMPERATURE POWER PIPING

It's this basic difference in principle that makes pressure-seal the perfect bonnet joint seal on high pressure steam valves. Bolted bonnet valves must depend on heavy flanges and bolts to hold line pressure, and are still subject to leaks. Crane Pressure-Seal design makes the pressure do the work. And because pipe line pressure keeps the joint tight, leakage is impossible and no maintenance is required.

Pioneered and Proved by Crane. As a model of simplicity, Crane Pressure-Seal design stands out alone. For Crane pioneered the development and successful construction of these valves, as well as their usage. This is no more than the many satisfied users expected from Crane, the leader in the valve industry.

Approved and Preferred by Power Engineers. Today, Crane Pressure-Seal Bonnet valves are making new performance records in power plants around the world. You should know all about them if you are planning any new, expanded or modernized piping installations. Consult your engineering firm or get in touch with your nearby Crane Branch for performance data, specifications, etc.

CRANE CO., 836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving All Industrial Areas

HOW THIS LEAK-PROOF BONNET JOINT OPERATES

Bonnet joint is inside the valve, sealed with a wedge-shaped seal ring. Fluid pressure acting against the entire area of bonnet is carried by the lesser area of the seal ring. Because sealing pressure is always many times greater than fluid pressure, leakage is impossible.

Revolutionary Design in Every Detail

1. *New Streamlining Inside and Out*
2. *New Non-Sticking Flexible Disc*
3. *More and Easier Flow*
4. *Easier Operation and Inspection*
5. *Reduced Over-All Dimensions*
6. *Amazing Weight-Savings; Gate Valves up to 60% Lighter than Conventional Design*

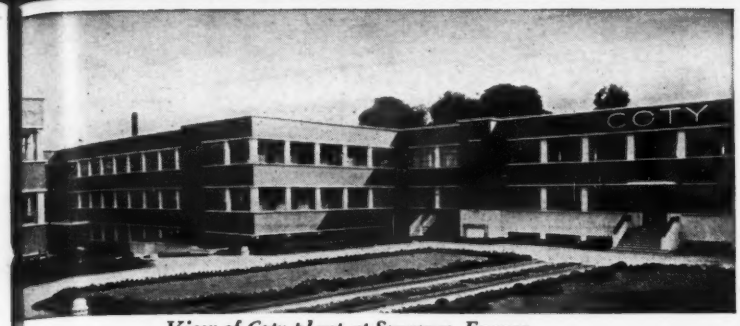
12-in. 1500-Pound Globe Stop-Check, Toggle-Operated.

EVERYTHING FROM . . .

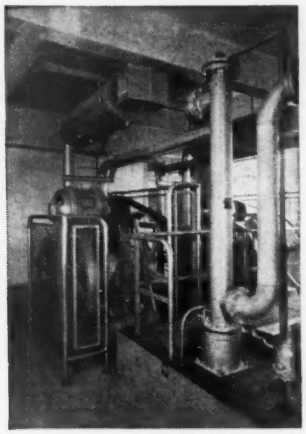
VALVES • FITTINGS
PIPE • PLUMBING
AND HEATING

CRANE

FOR EVERY PIPING SYSTEM



View of Coty plant at Suresnes, France



Rear view of Worthington Compressors, showing Multi V Drive aftercooler and receiver.

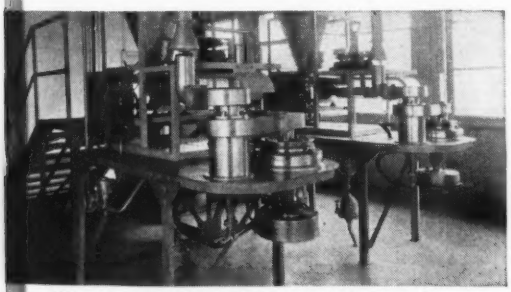
These Machines Put the Air in "Air-Spun" Face Powder

For a number of years, Coty, Inc. (Societé COTY), in its plant at Suresnes, France, has used air-actuated micronizers to provide the high degree of fineness and smoothness that characterizes Coty's "Air-Spun" face powders.

Coty pioneered in this development of supplementing mechanical methods of processing the ingredients with this method which causes the mechanically-processed materials to impinge against each other, effecting extremely minute pulverization.

Carefully metered volumes of compressed air are delivered at 95 psi to the micronizers, where directional air nozzles create intensive and diverse swirls, producing the desired pulverization.

To provide oil- and moisture-free compressed air, Coty selected Worthington compressors, 12 x 11 machines rated at 95 psi, 250 cfm, and 25 rpm, driven by 50 hp, 1200 rpm motors.



Micronizers in Coty plant. Air fed through directional nozzles causes powder particles to impinge against each other, producing minute pulverization. Particle size is controlled by rate of feed.

Special Features

In order to reduce vibration and noise to a minimum, the compressors were specially-built. Aluminum, rather than cast-iron, pistons reduced inertia and resultant unbalanced shaking forces. Placing the motor nearer the crank end of the machine brought the center of gravity into a more favorable location in respect to the foundation.

To prevent the machines from operating in synchronism for any length of time, sheave diameters were modified slightly, giving a compressor speed of 250 rpm for No. 1 unit, 245 rpm for No. 2 unit, and 240 rpm for No. 3 unit. Although two machines could at some time, be in step, synchronism would be instantaneous only. Adjacent compressors on the same center line were installed opposed, as a further compensation for unbalance.

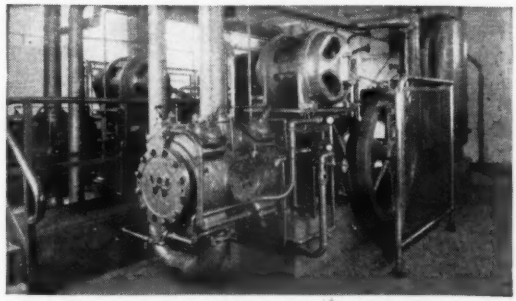
Sensitive Mercoid pressure switches, actuated by air-receiver pressure, are set for slightly different pressures so only those compressors required to meet air demands will operate. No. 1 pressure switch opens at 100 and closes at 95 psi; No. 2 pressure switch opens at 99 and closes at 94 psi; No. 3 pressure switch opens at 98 and closes at 93 psi; and No. 4 pressure switch opens at 97 and closes at 92 psi.

Timing

The timing relay, actuated by a small subsynchronous motor, provides a delay between the energizing of any two motor starters, preventing second motor from starting until the first is running with the compressor fully loaded.

The four reset pushbuttons serve as cutout switches during weekend and shutdown periods. Also, they prevent the automatic restarting of any unit after it has been automatically shut down from causes such as loss of jacket cooling water or current failure.

Each compressor has its individual aftercooler and air receiver. Aftercoolers, somewhat oversize, provide a longer cooling time to give a maximum of oil and moisture separation. An automatic moisture trap expels oil and moisture separated in the aftercooler. A second trap removes further condensation and separation occurring in the receiver. Twin mechanical oil separators are installed just beyond the air receivers. To prevent discoloration difficulties the inside of the aftercoolers and receivers are galvanized, or covered with rust-proof paint; distribution-system piping and fittings are of brass.



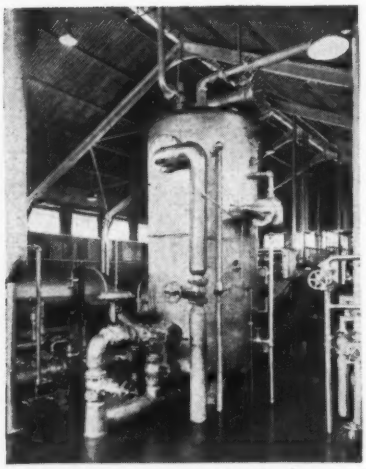
Two 12 x 11 Worthington HB Compressors which furnish air to the micronizers.

NEWS

FROM THE POWER FRONT

AS REPORTED BY THE DEVELOPMENT ENGINEERS FIELD SERVICE REPRESENTATIVES AND CUSTOMERS OF WORTHINGTON

NEWS from the power front

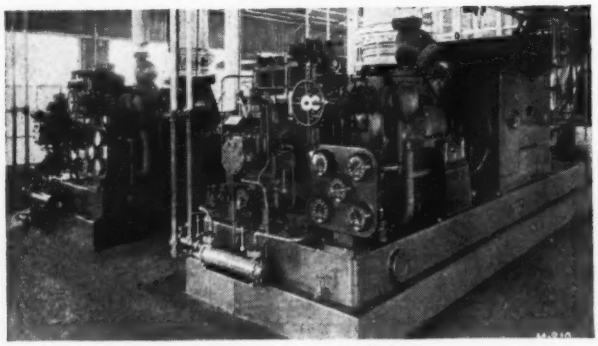


Worthington deaerating feedwater heater—90,000 lb. hr.

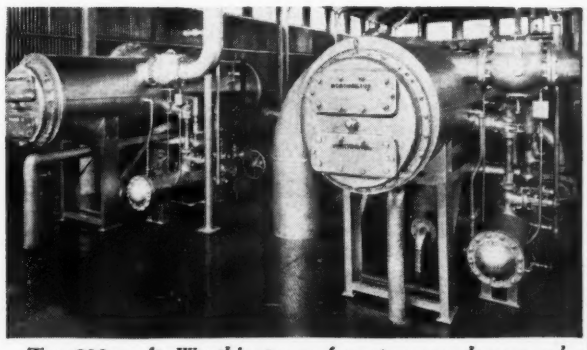
It Takes a Lot of Worthington Equipment to "Dry Out" Gas

These pictures show some of the Worthington equipment installed in The Chicago Corporation's Feazel & Kinsey gasoline plant located at Carthage, Texas, designed and built by Stearns-Roger Manufacturing Co. of Denver.

The purpose of this plant is to take the wet high-pressure gas produced from the high-pressure gas wells in the Panola County fields, and separate the water vapor from the recoverable hydrocarbon vapors consisting primarily of propane, butane, and gasoline. The residue dry gas leaving the absorbers is delivered to the pipe line for transmission and distribution.



Two 750 KW Worthington steam turbine-generator units



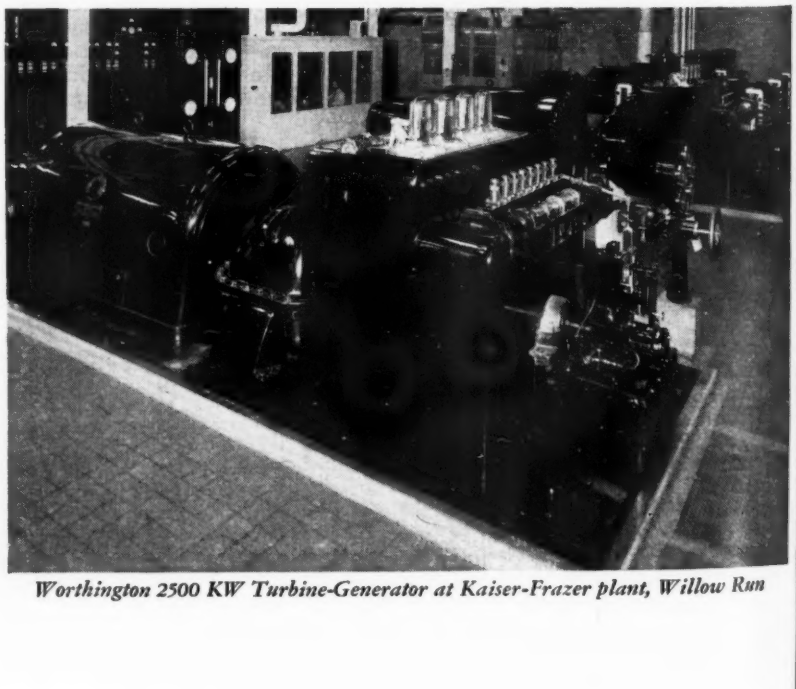
Two 800 sq. ft. Worthington surface steam condensers and condenser accessories

What Makes Willow Run Run?

Electric power for the Kaiser-Frazer plant at Willow Run, Michigan, is furnished by two Worthington 2500 kw Turbine-Generators.

These units are direct-connected, 3600 rpm, 13,800 volt, 3 phase, 60 cycle. They operate on steam at 250 lb initial pressure, 470 F total temperature, exhausted at adjustable pressures of 15-50 lb to a condenser of 27½ in. vacuum.

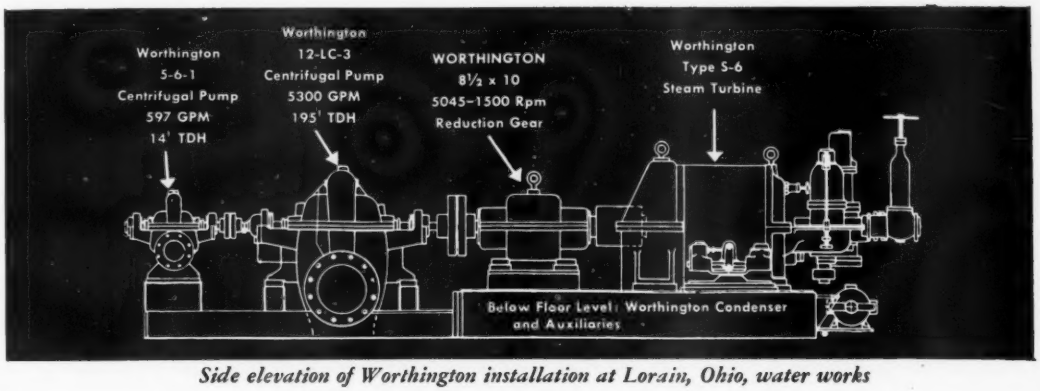
Installed in 1941, these Worthington Turbine-Generators supply both electric power and extracted steam for plant heating.



Worthington 2500 KW Turbine-Generator at Kaiser-Frazer plant, Willow Run

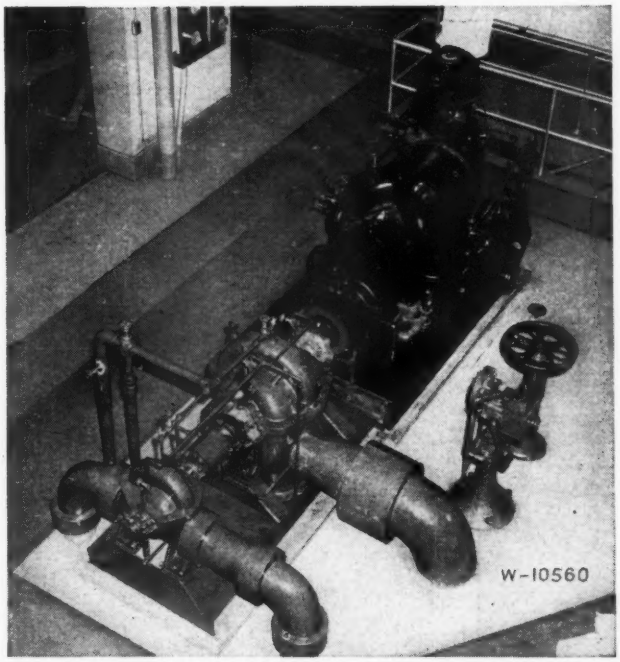
Worthington Pump and Machinery Corporation
Harrison, N. J.

NEWS



Side elevation of Worthington installation at Lorain, Ohio, water works

A Lot of Water Has Gone Through This Pump



Worthington Centrifugal Pump in water works at Lorain, Ohio

More than ten years ago, the city of Lorain, Ohio (a community of 45,000 people) installed a Worthington centrifugal pumping unit to deliver seven and one half million gallons of water per day.

H. B. Wallace, chief engineer of the water works, reported recently that this Worthington pump has operated continuously ever since with never a shutdown except for routine maintenance.

During the majority of the time the pump has handled the entire capacity load; and at various times it has been required to handle appreciable overloads.

The complete water works unit consists of a 7.5 mgd 12 in. pump that is driven by a geared steam turbine with the main pump shaft double extended for connection to the condenser circulating pump; also a surface condenser with its auxiliaries.

All elements are of Worthington manufacture, thus giving undivided responsibility for proper operation.

Springfield Purchases 3rd Worthington Turbine Generator Unit

The city of Springfield, Minnesota, has for a long time operated its own electric power plant.

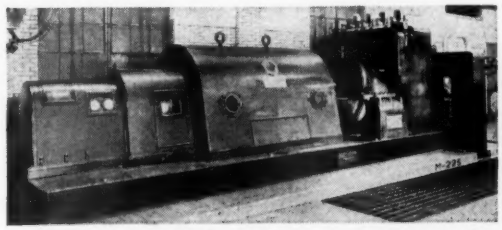
In 1895, electric power was furnished in a limited way from 5 to 10:30 P.M. each day by a 40 kw generator driven by gasoline engine. In 1902 a steam engine with 50 kw belted generator was installed. In 1915 this was replaced by a 100 kw steam engine, and the system was converted from direct current to alternating. At the same time a heating system for the business district was installed, using the exhaust steam which would otherwise be lost to atmosphere.

Further expansion came in 1923 with a 250 kw steam engine. By 1937 the electric load had so far outstripped the heating load that it became necessary to exercise economy in order to reduce cost of operation. A 750 kw Moore automatic bleeder condensing turbine was installed; it was designed for 400 lb steam pressure, 670 F temperature.

Then the necessity for adapting all the modern practices of steam plants — including higher pressure and temperature–led to the purchase of a 1000 kw Moore automatic bleeder condensing turbine.

Acquisition of REA power contracts necessitated further expansion of the facilities. Last year a 2000 kw Worthington automatic extraction unit was put into operation along with a new high pressure boiler.

The plant now realizes maximum efficiency from the advantages of modern design.



Worthington 2000 kw turbine generator, City of Springfield, Minnesota

NEW METHODS BRING "SPECIAL-MOTOR" SMOOTHNESS TO STANDARD MOTORS

Motors have been made in much the same way for many years, until Westinghouse—with many years of leadership in a-c motor developments—departed from "tradition" in electric motor concepts, and built the Life-Line.

Motor-making traditions have been broken by the basketful. Users were surveyed to find what they wanted in standard motors that they were not getting. Life-Line motors were designed and built from scratch—by new methods and new tools in a totally new plant—to include these features.

Quieter operation was one feature motor users asked for. It's important in many places—fans, blowers, air conditioning. Life-Line motors provide it. Life-Line ventilating design limits "windage" noise. New manufacturing techniques that insure absolute alignment and accuracy of fit, reduced vibration. The result is a *standard* motor with the quietness and freedom from vibration evidenced in the dramatic demonstration shown opposite. Modern tests check every motor for accuracy in manufacture.

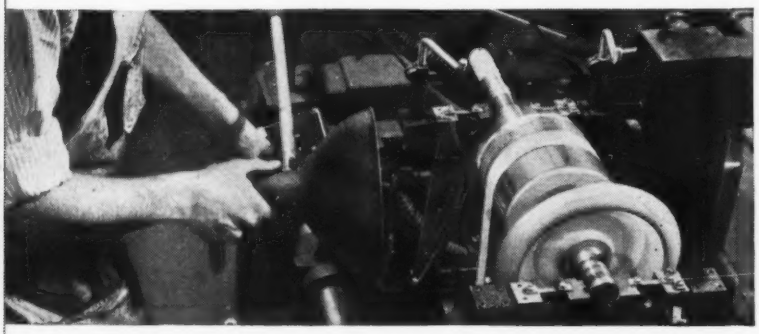
You will want full details on other Life-Line features—its solid steel construction—freedom from lubrication for 5 years or longer—new compactness and light weight. Life-Line motors, now built in sizes from 1-15 hp, are available in standard and near-standard types from stock. Other sizes and types—up to 200 hp—will soon be changed over to modern Life-Line design. Check your nearest Westinghouse office for deliveries—or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-21457

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Life-Line motors

MEASURED—WITH AIR New extreme accuracy for checking diameters of shafts and bearing bores is made possible by this precision gauge. Size is checked by any variations in air stream escaping between the part being checked and the master gauge.



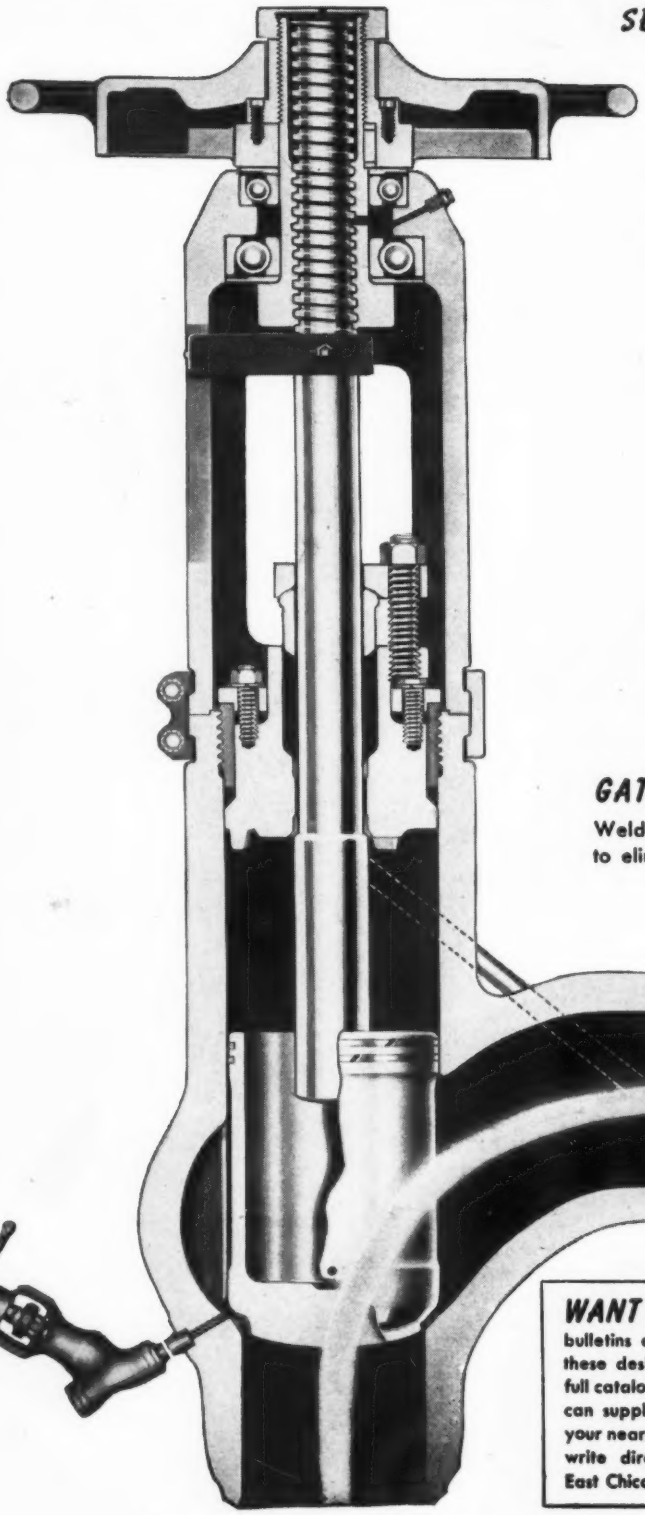
EVERY UNIT BALANCED. *Every* Life-Line rotor—not random samples—is balanced on a Dynetric balancing machine* to insure maximum possible freedom from vibration of every unit.
**Reg. U. S. Pat. Off.*

MOTOR "ASTHMA" CHECK. Sounds that shouldn't be there get by this "noise detective". Audiometer tells noise wave le sound level meter (left) checks decibel rating; sound an (right) tells the relative amount of different frequencies resu

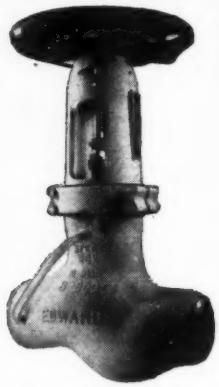
Life-Line
SMOOTH? HERE'S PROOF! Coin balanced on edge on a Life-Line motor remains undisturbed as motor is started, runs and stops—dramatic evidence of Life-Line's freedom from vibration and resulting noise!

They're New!

NEW PRESSURE SEAL BONNET VALVES.. NEW FORGED STEEL GLOBE VALVES.. NEW IMPACTOR HANDWHEEL



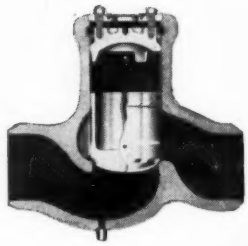
SELF-SEALING BONNET JOINTS, 30% MORE FLOW



Now you can get Edward pressure-seal bonnet valves in gate, globe or angle patterns for stop, check or non-return service. New features for lower and lower pressure drop have been built in—and **proved.** On no other valve series is there more proven flow data.

EDWARD PATENTED EVALTHRUST YOKE BUSHING

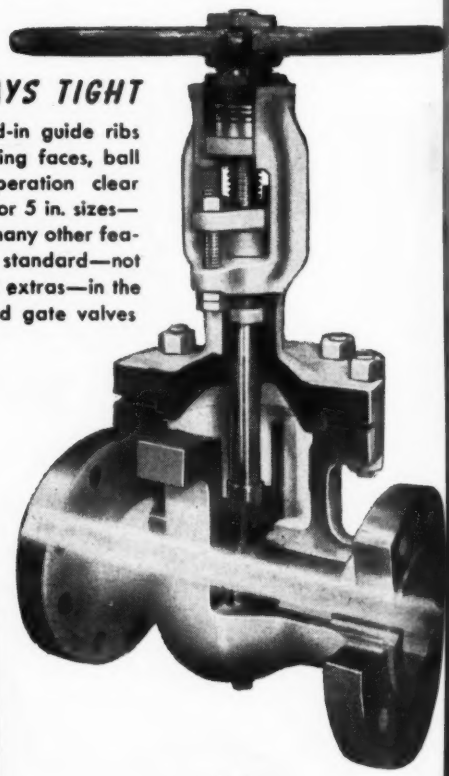
and Impactor handwheel for easiest closing in cramped locations is standard on stop and non-return series. So is closure indicator.



ON CHECK VALVE, left, and non-return valve, far left, note new enclosed dash-pot disk, Edward Equalizer for high disk lift and free flow passage. The whole series is regularly built in chrome-moly steels for stability at high temperatures.

GATE VALVE THAT STAYS TIGHT

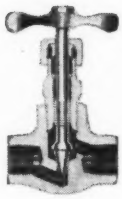
Welded-in Stellited seats, welded-in guide ribs to eliminate wedge drag on seating faces, ball bearing operation clear down to 4 or 5 in. sizes—these and many other features are standard—not added cost extras—in the new Edward gate valves



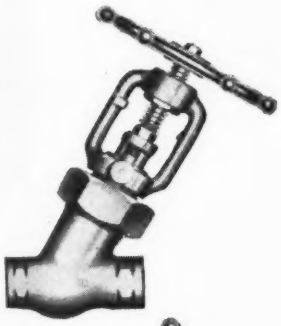
WANT MORE DATA? Special bulletins are now available on most of these designs. A few are so new that full catalog data isn't ready yet, but we can supply dimensional drawings. Ask your nearest Edward representative, or write direct to Edward Valves, Inc., East Chicago, Indiana.

A WHOLE NEW GROUP of Edward Steel Valve Designs

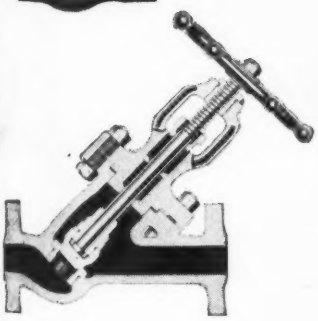
NEW GAGE VALVES.. NEW WELDED BONNET UNIVALVES.. NEW BLOW-OFF VALVES... NEW GATE VALVES



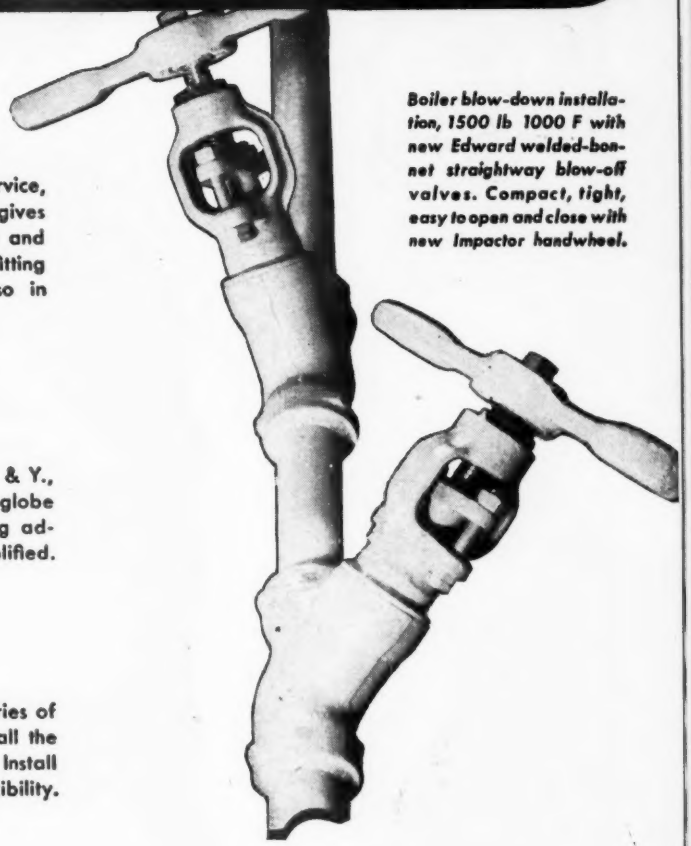
FINE REGULATION ON GAGE LINES For gage and meter service, the redesigned Edward Fig. 152 valve gives close flow regulation with small seat port and longer seat-stem contact area. New form fitting T-Handle. Rated 4000 lb W.O.G. Also in 12% Cr. and 18-8 stainless steels.



ALL-PURPOSE SMALL GLOBE VALVE Here's a new O. S. & Y., union bonnet, bolted gland forged steel globe valve for a multitude of services. Packing adjustment or replacement greatly simplified. Rated 800 lb, 750 F.



BLOW-OFF FLEXIBILITY A new series of 300 lb O. S. & Y. blow-off valves with all the design features of high pressure valves. Install them in any position for greatest piping flexibility.



Boiler blow-down installation, 1500 lb 1000 F with new Edward welded-bonnet straightway blow-off valves. Compact, tight, easy to open and close with new Impactor handwheel.

NEW, EASIER CLOSING Now the Edward Impactor handwheel, modernized and improved, is available on many small valves as well as large. Easy-to-grip cross bar delivers 2.8 times the closing load of ordinary handwheels. No wrenches or extension bars needed.

NEW WELDED-BONNET UNIVALVE

Already lowest in pressure drop among forged steel globe valves, Edward patented welded bonnet Univalves have been modified to give even less resistance to flow, less wear-producing turbulence. For top temperature service and up to 2500 lb pressure, here is the valve that offers the most.

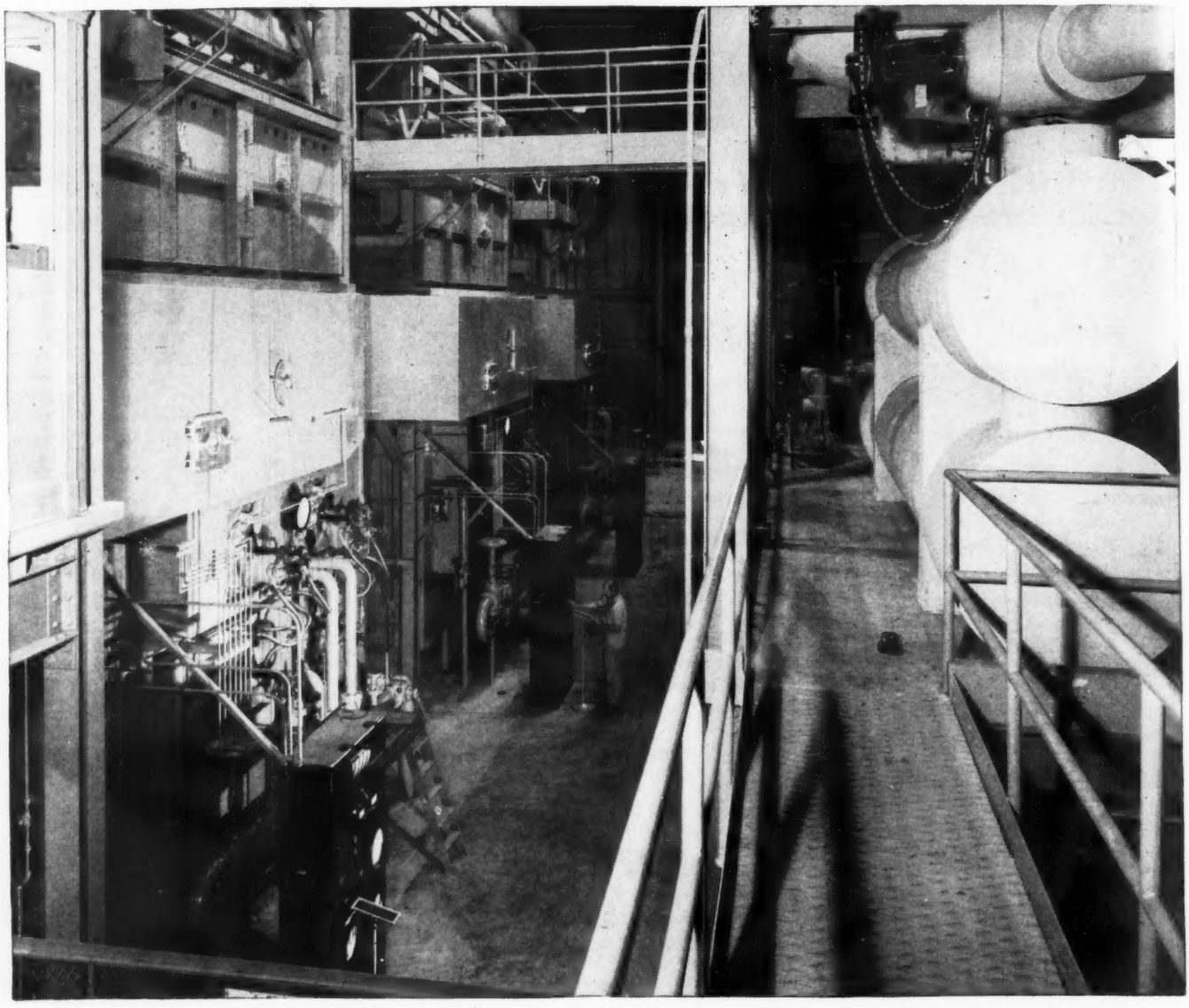
Edward Valves, Inc.

SUBSIDIARY OF ROCKWELL MANUFACTURING CO. EAST CHICAGO, INDIANA

SEE THEM AT THE POWER SHOW

These new designs, and many other Edward and Nordstrom lubricated plug valves too, will be on display at the Edward booths, No. 26 and 27 at the Power Show, Grand Central Palace, New York, Nov. 29 to Dec. 4.

Today—More Republic



Interior view of a 400,000 lb. steam generating plant in a modern industrial plant. Steam is generated in these gas fired boilers which are operated by a Republic automatic combustion control system.

The installation of Republic automatic controls on your boiler (or boilers) will enable you to:—

SAVE FUEL by automatically maintaining highest combustion efficiency.

INCREASE STEAM OUTPUT by operating the boilers at test efficiency 24 hours a day, 7 days a week.

CONSERVE MANPOWER by automatically performing the many routine repetitive adjustments.

REDUCE OUTAGES by maintaining uniform operating conditions and thereby prevent the chain-of-event type of trouble that frequently develops as a result of incorrect boiler operation.

REPUBLIC
INSTRUMENTS
AND CONTROLS

Combustion Control Systems

ARE BEING SPECIFIED THAN EVER BEFORE

because...

Built into the Republic combustion control systems are the many important features that enable it to fulfill all the conditions of theoretically perfect combustion control and still meet all the demands of everyday operation.

Check the following features against your list of "musts" when specifying a perfect combustion control system.

CENTRALIZED CONTROL:
The operation and control of the boiler or boilers is centralized at the master controller.

FUEL-AIR RATIO INDICATOR:
The master controller is provided with mercury manometers or gages which indicate the measured fuel and air inputs to the boiler and the fuel-air ratio.

FUEL-AIR RATIO ADJUSTMENT:
A handwheel on the front of the master control panel provides a convenient means for adjusting the fuel-air ratio.

FUEL VARIATIONS:
Automatically compensates for variations in fuel to maintain combustion conditions constant.

ALL BOILER RATINGS:
Maintains proper fuel-air ratio over the entire range of boiler ratings.

CONSTANT STEAM PRESSURE:
Maintains the plant steam pressure within narrow limits of variation by proportioning the fuel and air inputs to the load.

LOAD DISTRIBUTION:
Provides a means of distributing the load among the boilers as desired.

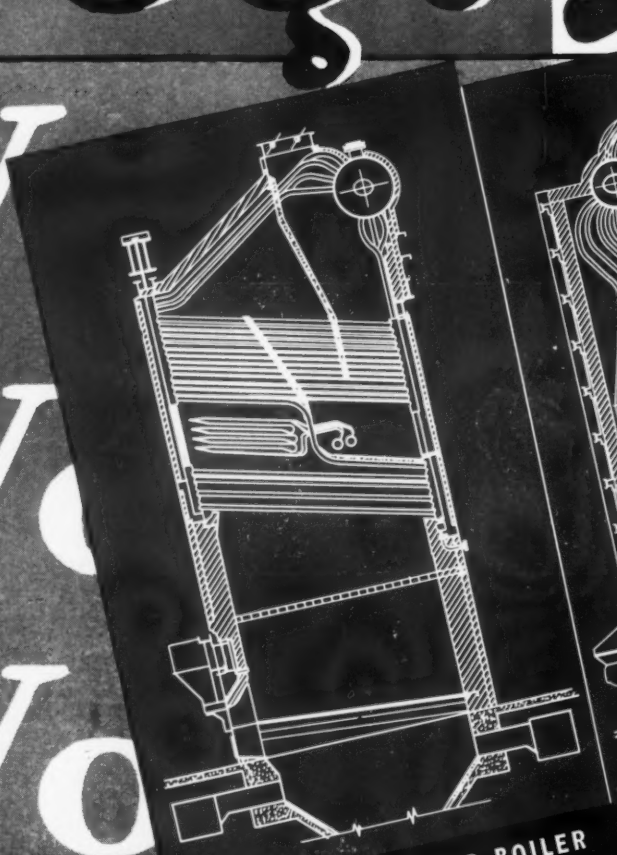
MANUAL CONTROL:
Boiler ratings can be controlled manually by a handwheel located on the front of the panel.

Find out about Republic control systems. One of our engineers will be glad to consult with you at any time without obligation on your part. Write us today.

Republic Flow Meters Co.

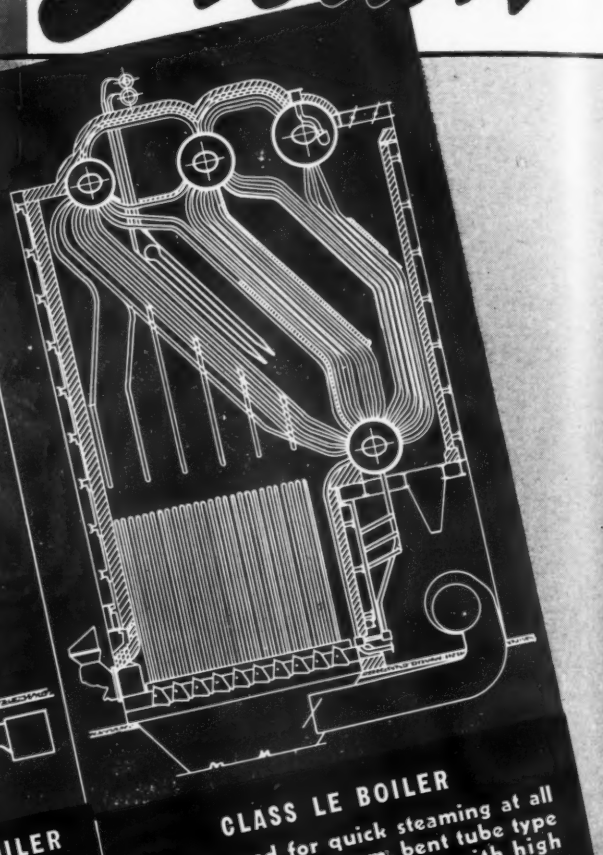
2240 Diversey Parkway • Chicago 47, Illinois

Vogt Steam



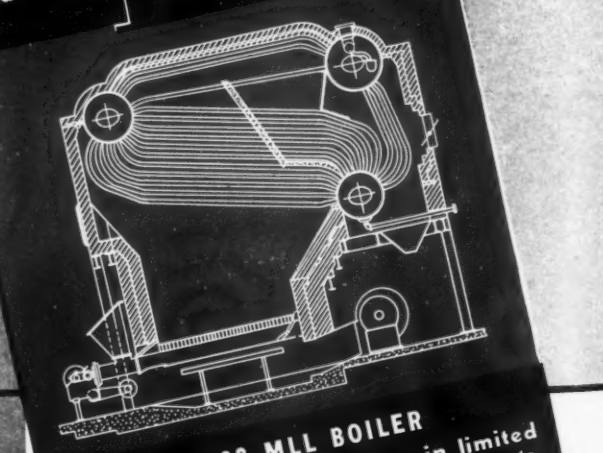
SECTIONAL HEADER BOILER

Sinuous forged steel headers feature this straight tube, cross-drum type generator. Staggered tubes achieve high heat transfer rate and insure efficient operation.



CLASS LE BOILER

Unsurpassed for quick steaming at all ratings, this four drum, bent tube type will carry high overloads with high efficiency.

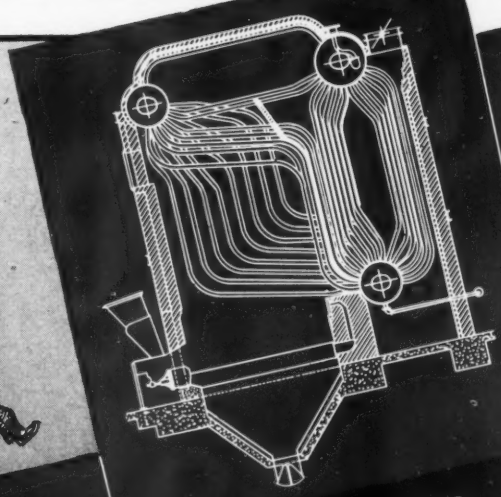


CLASS MLL BOILER

Provides maximum capacity in limited headroom. Widely used in industrial plants, institutions, etc., having moderate processing or power loads, and for heating.

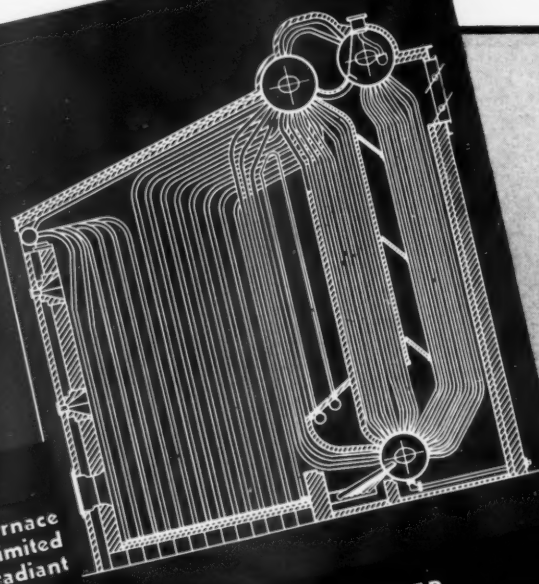
HENRY VOGT
MACHINE CO., Inc.

GENERATING UNITS



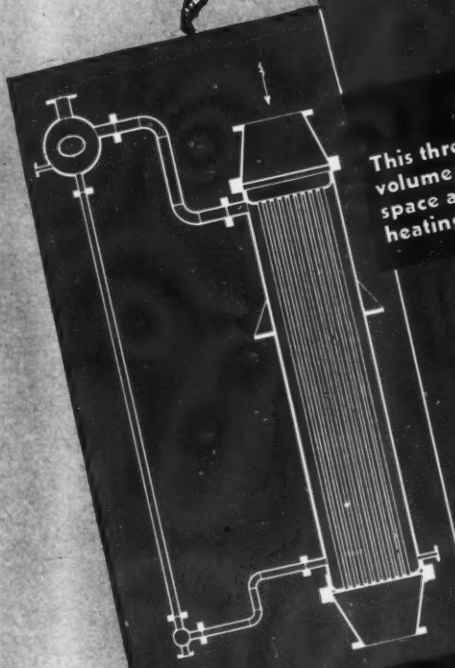
CLASS VL BOILER

This three drum design has large furnace volume in a unit which occupies limited space and provides high ratio of radiant heating surface.



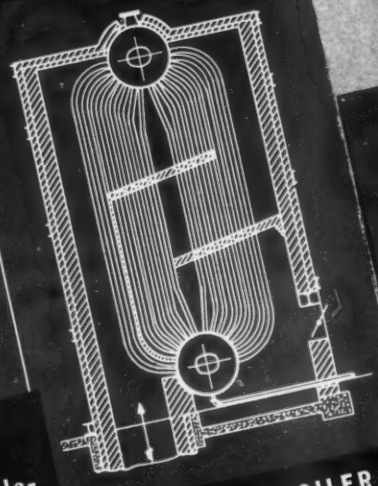
CLASS VR BOILER

An efficient, high-duty unit with water-cooled furnace for suspended fuel firing, such as powdered coal, oil, or gas.



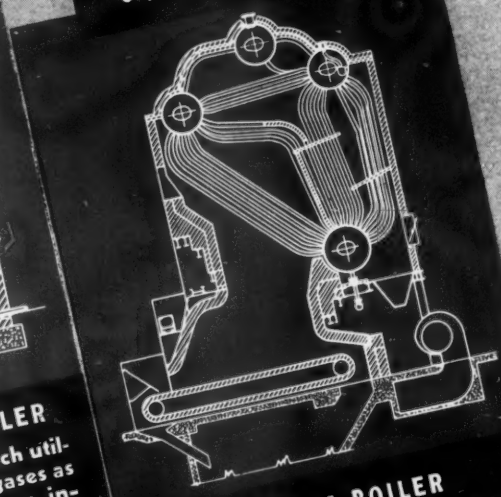
REFINERY WASTE HEAT GENERATOR

Shell and tube type designed to utilize high temperature gases from refinery processes such as those from catalytic units.



WASTE HEAT BOILER

A water-tube type which utilizes the heat in waste gases as produced by numerous industries. Designs will accommodate gases having high dust content.



CLASS M BOILER

This four drum, bent tube unit has the steam drum above the water level and delivers steam with 15°-18° superheat.

See our Condensed Catalog
In Sweets 1949 Power Plants File

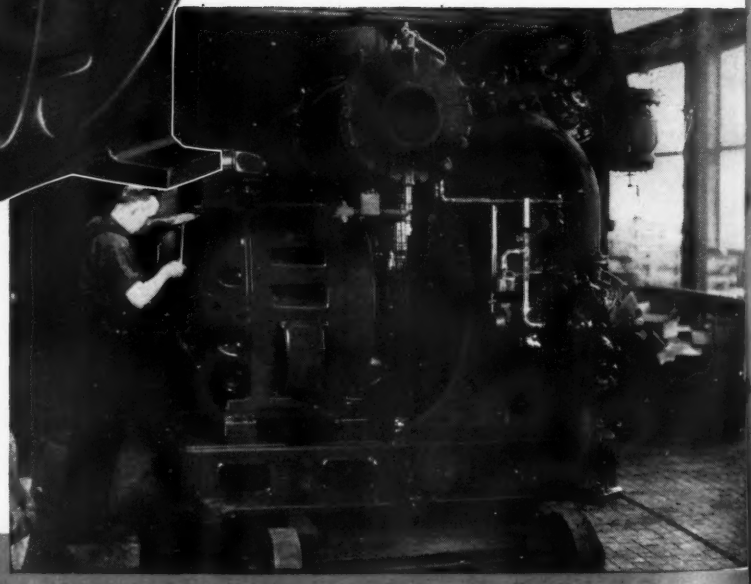
1000 WEST ORMSBY STREET
LOUISVILLE 10, KENTUCKY

BRANCH OFFICES: *New York • Chicago*
Cleveland • Philadelphia • Dallas

they're here... they're

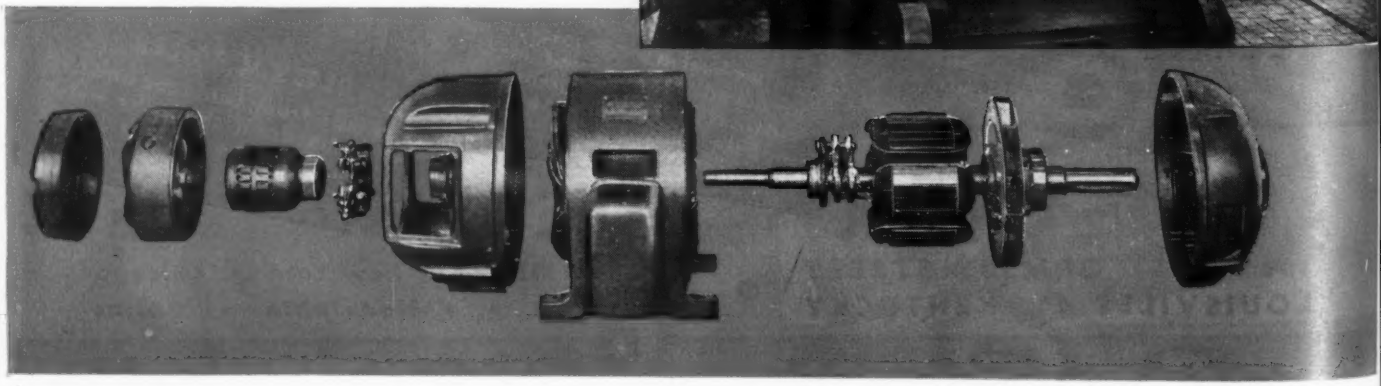
NEW HIGH

A new TRI-CLAD Synchronous Motor typical of those machines rated at about 500 hp at 720 rpm.



A new TRI-CLAD High Speed Synchronous Motor, rated 250 hp at 600 rpm, direct coupled to an air compressor.

Exploded view of G-E TRI-CLAD machine.



TRI-CLAD

REG. U.S. PAT. OFF.

SPEED SYNCHRONOUS MOTORS AND GENERATORS

These new synchronous motors and generators bring you the famous TRI-CLAD improvements:

Extra Protection Features!—against physical damage—against electrical breakdown—against operating wear and tear.

New Styling!—smooth, rounded contours—baffled ventilating louvers—smooth-corners on exciters and conduit boxes.

Following General Electric design leadership, the new line of Tri-Clad synchronous motors and generators give you the same design features that made Tri-Clad motors so successful in more than a million and a half industrial applications.

Tri-Clad construction gives you protection where it counts. Frames and end shields with no openings above the center line—give protection against dripping liquids, falling objects, and accidental blows.

You get protection against electrical breakdown in normal operations. Proved insulating materials of the highest quality are used throughout. Small sizes (through frame 945) use Formex* wire for low voltage windings. Larger size coils are form wound and molded accurately to slot size.

Bearings are completely enclosed in cast iron with close running fits for long life with minimum maintenance. Deep oil reservoirs insure adequate lubrication with clean, cool oil.

You can get synchronous motors in the new Tri-Clad design in ratings from 20 hp to 1000 hp at 60 cycles, speeds from 514 to 1800 rpm. Synchronous generators are available from 12½ to 1250 kva. Direct connected exciters are available for any rating.

About ten years ago, the Tri-Clad design was introduced to combine the important features demanded by industry. Since then, it has been further improved with additional refinements—all of which have been incorporated in this new line of synchronous motors and generators.

For more information on how you will benefit from Tri-Clad construction in your synchronous motor and generator installations, contact your nearest G-E sales engineer. For detailed construction features, write for GEA-5113 (Motors) or GEA-5125 (Generators). *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

*Reg. U. S. Pat. Off.

Typical TRI-CLAD High Speed Generator with direct-connected exciter.

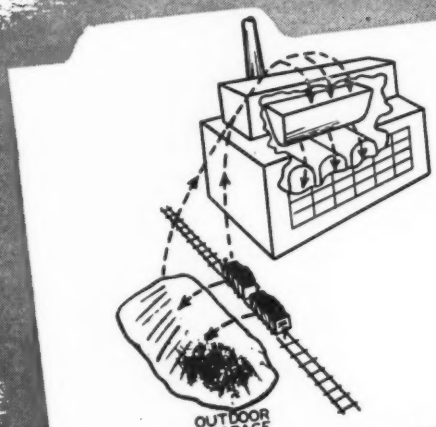
GENERAL ELECTRIC

770-1

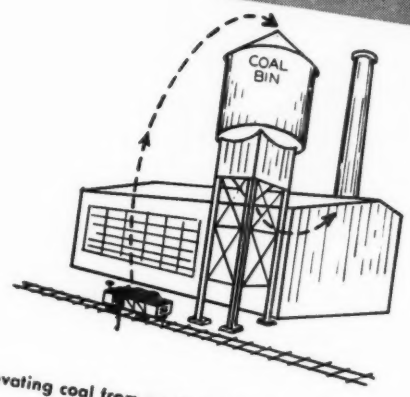
HELP WANTED?

Whatever Your Bulk Materials Handling Problem

S-A Can Give You Selective Aid

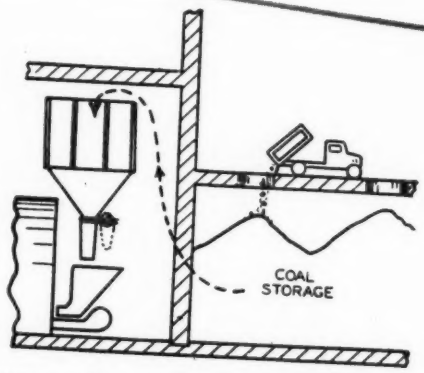


Moving coal from cars to bunkers and outdoor storage, and reclaiming from storage to bunkers.



Elevating coal from car to outdoor bin, then reclaiming and moving it to boiler house.

—From the files, here are a few of the many jobs successfully engineered and equipped by S-A



Moving coal from storage pit beneath driveway to bunker without dust or spillage.

When you sit down with the S-A engineer to study out a bulk materials handling problem, you and he are able to select the *best* system to do the job at lowest cost per ton. He doesn't have to solve every problem with just a few types of equipment. For S-A has the *complete line* of belt conveyors, bucket elevators, enclosed conveyors, skip hoists and other equipment designed for moving materials in bulk.

Add to this the know-how gained in 47 years—and you'll see why S-A is in a uniquely selective position to aid you. The first step in planning the most efficient and workable low-cost material handling system is this: Write us for the willing cooperation of an S-A engineer in matching specific units to your specific requirements.

STEPHEN S-A ADAMSON MFG. CO.

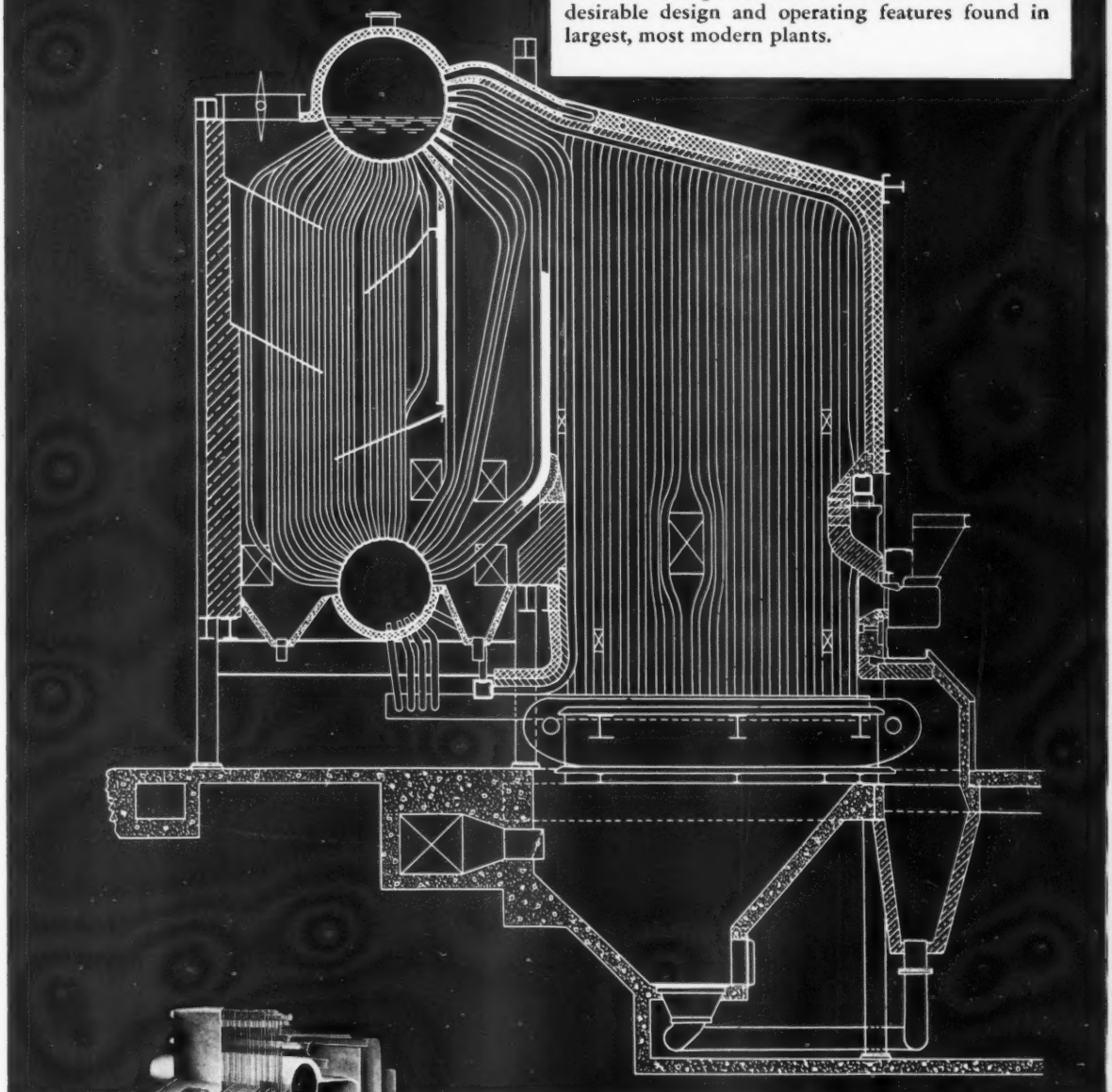
5 RIDGEWAY AVENUE, AURORA, ILLINOIS — LOS ANGELES, CALIF. • BELLEVILLE, ONT.

Designers and Manufacturers of All Types of
BULK MATERIAL HANDLING EQUIPMENT

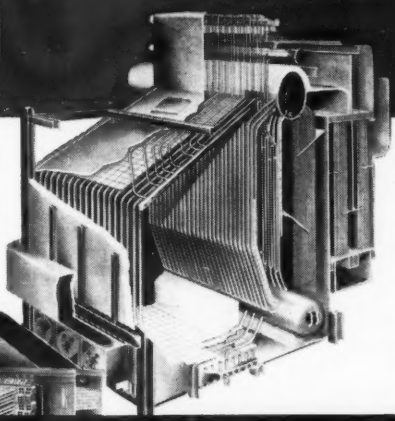
"To Meet User's Needs"

HERE is another example of a new two drum steam generator by Springfield that has been designed to meet the user's particular requirements. It is equipped to operate on Illinois coals with continuous ash discharge spreader stoker. Occupying less than 300 sq. ft. of floor space, the unit will produce 30,000 lbs. of steam per hour at an operating pressure of 150 p.s.i. Although of only moderate size, it provides the user with numerous desirable design and operating features found in largest, most modern plants.

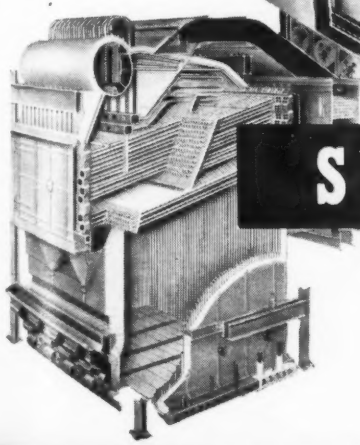
Location:
SANGAMO ELECTRIC CO.
Springfield, Ill.



SPRINGFIELD BOILERS



CHECK WITH YOUR CONSULTING ENGINEER ON YOUR MODERNIZATION AND NEW PLANT PROJECTS



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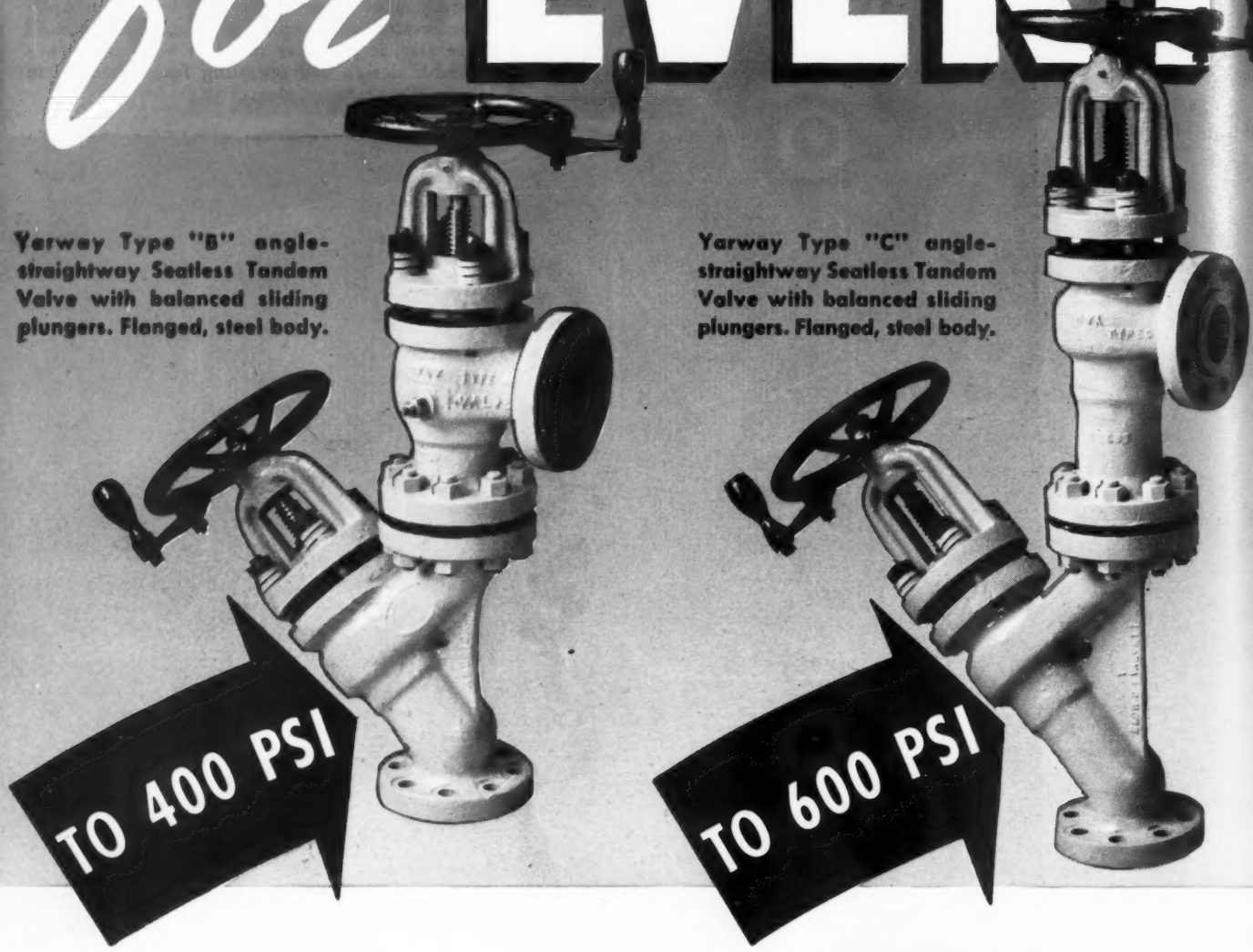
Yarway Type "B" angle-straightway Seatless Tandem Valve with balanced sliding plungers. Flanged, steel body.
TO 400 PSI
Yarway Type "C" angle-straightway Seatless Tandem Valve with balanced sliding plungers. Flanged, steel body.
TO 600 PSI

THERE'S A YARWAY

BLOW-OFF VALVE

Yarway offers boiler plant operators a complete Blow-Off Valve Service—distinct types of valves to meet the blow-down requirements of every steam plant.

These valves are the products of 40 years mechanical and metallurgical research—of practical field experience with thousands of installations—of experiments and testing in Yarway's own unique Steam Laboratory—and of a determination continually to lead the industry with the finest blow-down equipment that can be produced.

Because the Yarway line is complete you may be sure Yarway recommendations are based on experienced judgment that the type of valve selected will give long, trouble-free, money-saving service.

WRITE TO YARWAY FOR FREE BLOW-OFF VALVE BULLETINS. STATE YOUR BOILER PRESSURE.

YARNALL-WARING COMPANY
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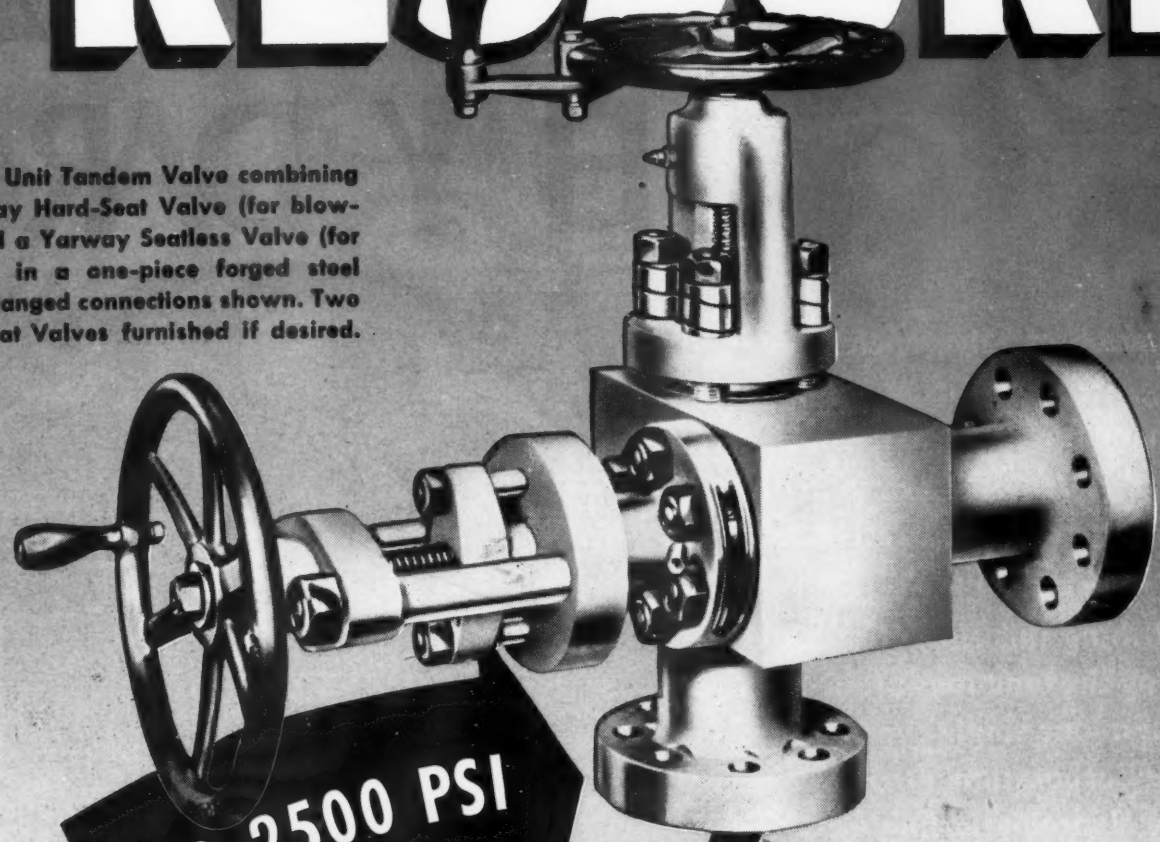
PRESSURE



Yarway Unit Tandem Valve combining a Yarway Hard-Seat Valve (for blowing) and a Yarway Seatless Valve (for sealing) in a one-piece forged steel body. Flanged connections shown. Two Hard-Seat Valves furnished if desired.

TO 2500 PSI

A Few Representative Users

OF YARWAY BLOW-OFF VALVES

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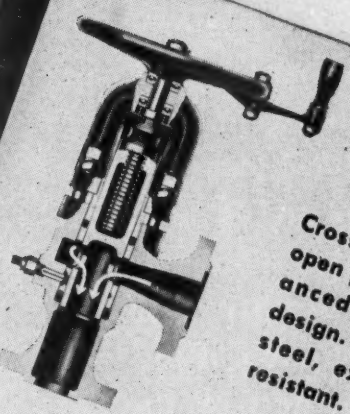

YARWAY SEATLESS ANGLE VALVE
Cross section of valve in open position. Notice balanced sliding plunger design. Plunger is nitrided steel, extremely wear-resistant.

YARWAY HARD-SEAT STRAIGHTWAY VALVE
Cross section of valve in open position. Stellited disc and seat. A worthy companion to the Yarway Seatless Valve for tandem use on higher pressure.

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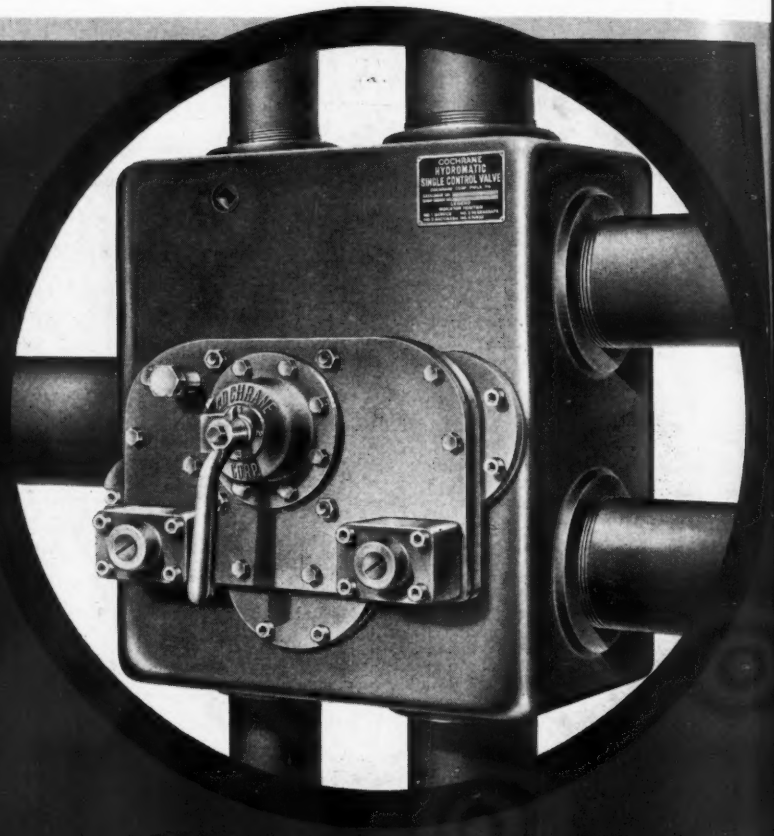

Simplification of valve operations in softening, demineralizing or other ion exchange systems as well as in filtering, is a vital factor in reducing costs, speeding operations and insuring accuracy of operation.

Accomplishing this simplification by integrating the functions of the usual valve nest in one single control valve, Cochrane Corporation introduces the Cochrane Hydromatic Single Control Valve now standard equipment on Cochrane Zeolite Softeners. This valve is, in effect, a six-position valve with four normal operating positions and two standby positions. The functions of the valve are smooth, positive and free from shock, and the single lever turns with ease. The power for the operation of the valve members is provided by the raw water itself through a pilot valve of rotary disc design. The Cochrane Hydromatic Valve is standard equipment on Cochrane Zeolite Softeners and Filters, and may be arranged for manual or automatic operation.

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MATIC SINGLE CONTROL VALVE

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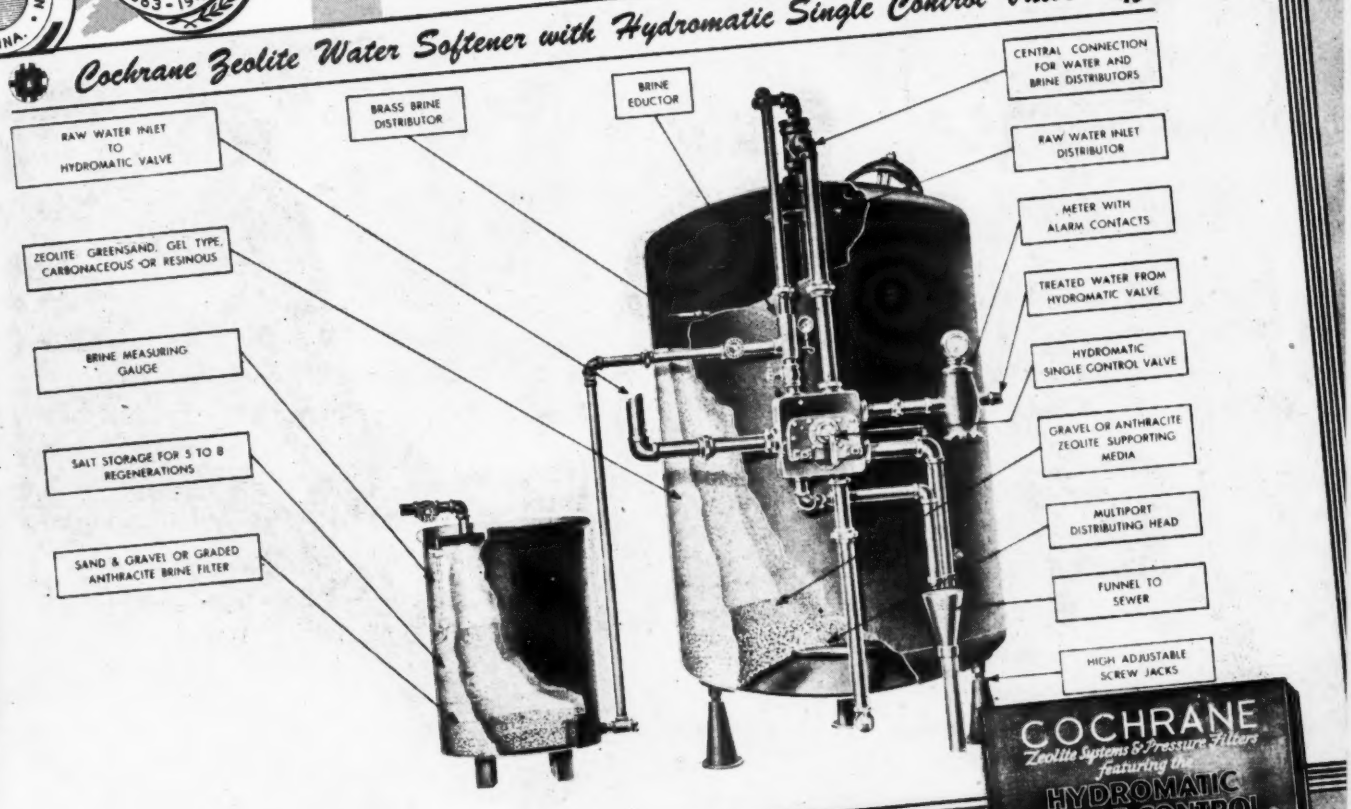
Cochrane Zeolite Water Softener with Hydromatic Single Control Valve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ZEOLITE GREENSAND, GEL TYPE, CARBONACEOUS OR RESINOUS
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BRASS BRINE DISTRIBUTOR
BRINE EDUCTOR
CENTRAL CONNECTION FOR WATER AND BRINE DISTRIBUTORS
RAW WATER INLET DISTRIBUTOR
METER WITH ALARM CONTACTS
TREATED WATER FROM HYDROMATIC VALVE
HYDROMATIC SINGLE CONTROL VALVE
GRAVEL OR ANTHRACITE ZEOLITE SUPPORTING MEDIA
MULTIPORT DISTRIBUTING HEAD
FUNNEL TO SEWER
HIGH ADJUSTABLE SCREW JACKS

Summarized Features

1. Four normal positions—Two standby
2. Pilot-actuated for smooth shock-free operation
3. Slow motion eliminates hydraulic shock
4. Compact, built-in Rate Controllers for wash or rinse
5. Tight Seating Valve prevents leaks

The story of Cochrane Hydromatic Valves is told in Publication No. 4460 which has just been published. Details of the valve, its advantages, suggested applications, method of operation, operating features, design features, etc. are described and illustrated. A copy will be sent on request. Coupon is for convenience.

Cochrane Corporation
3106 N. 17th St., Philadelphia 32, Pa.

Please send us a copy of Publication 4460 describing Cochrane Hydromatic Valve.

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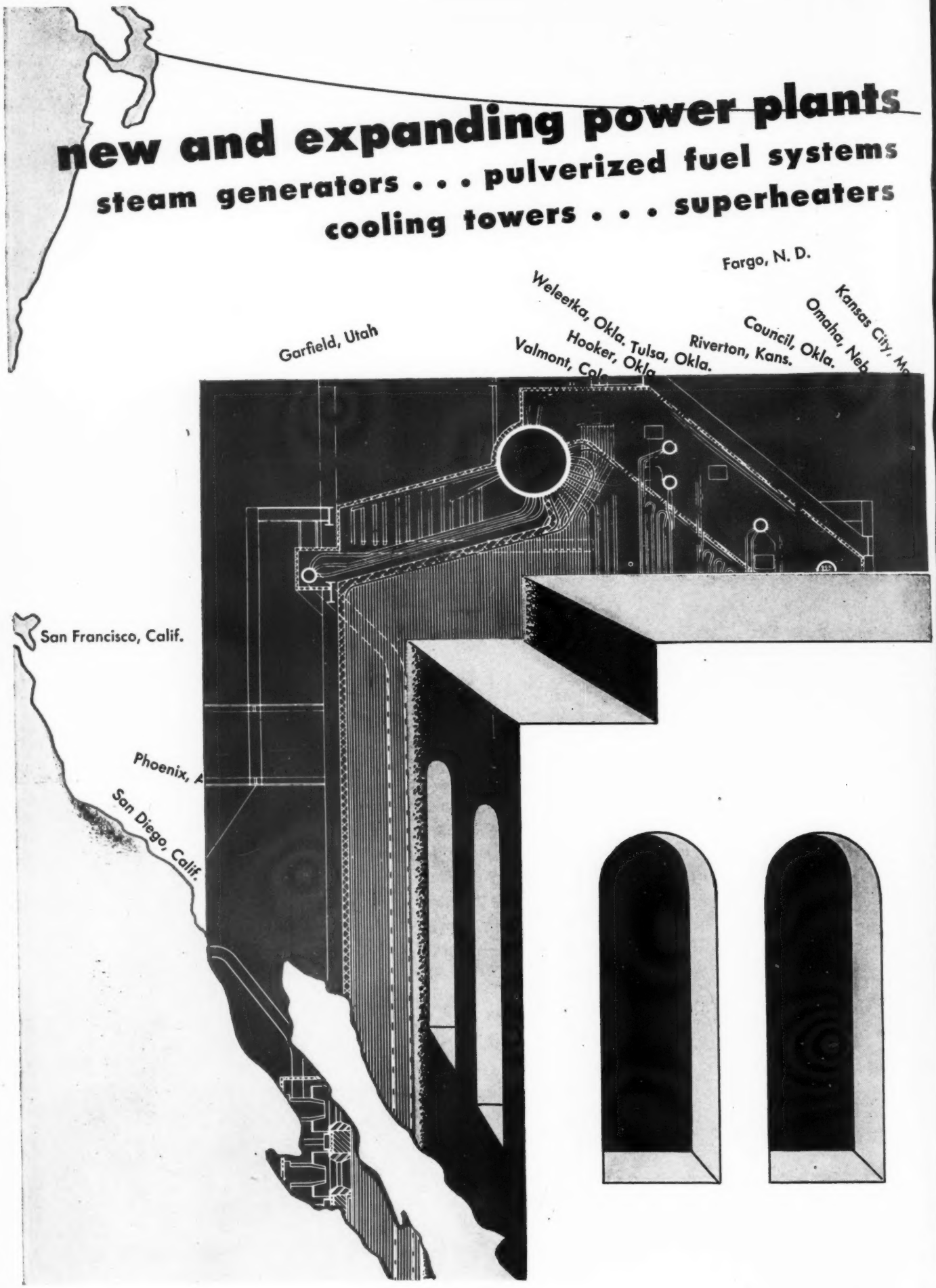

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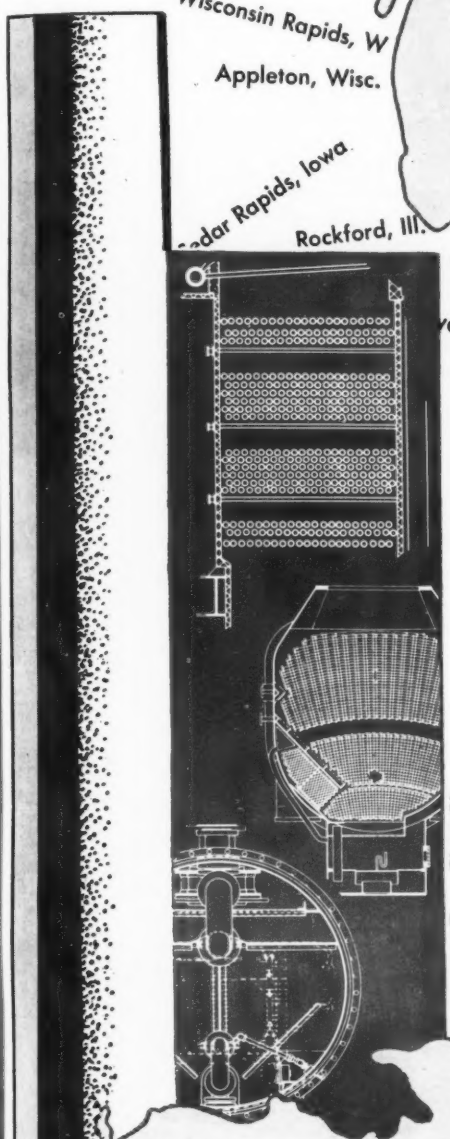

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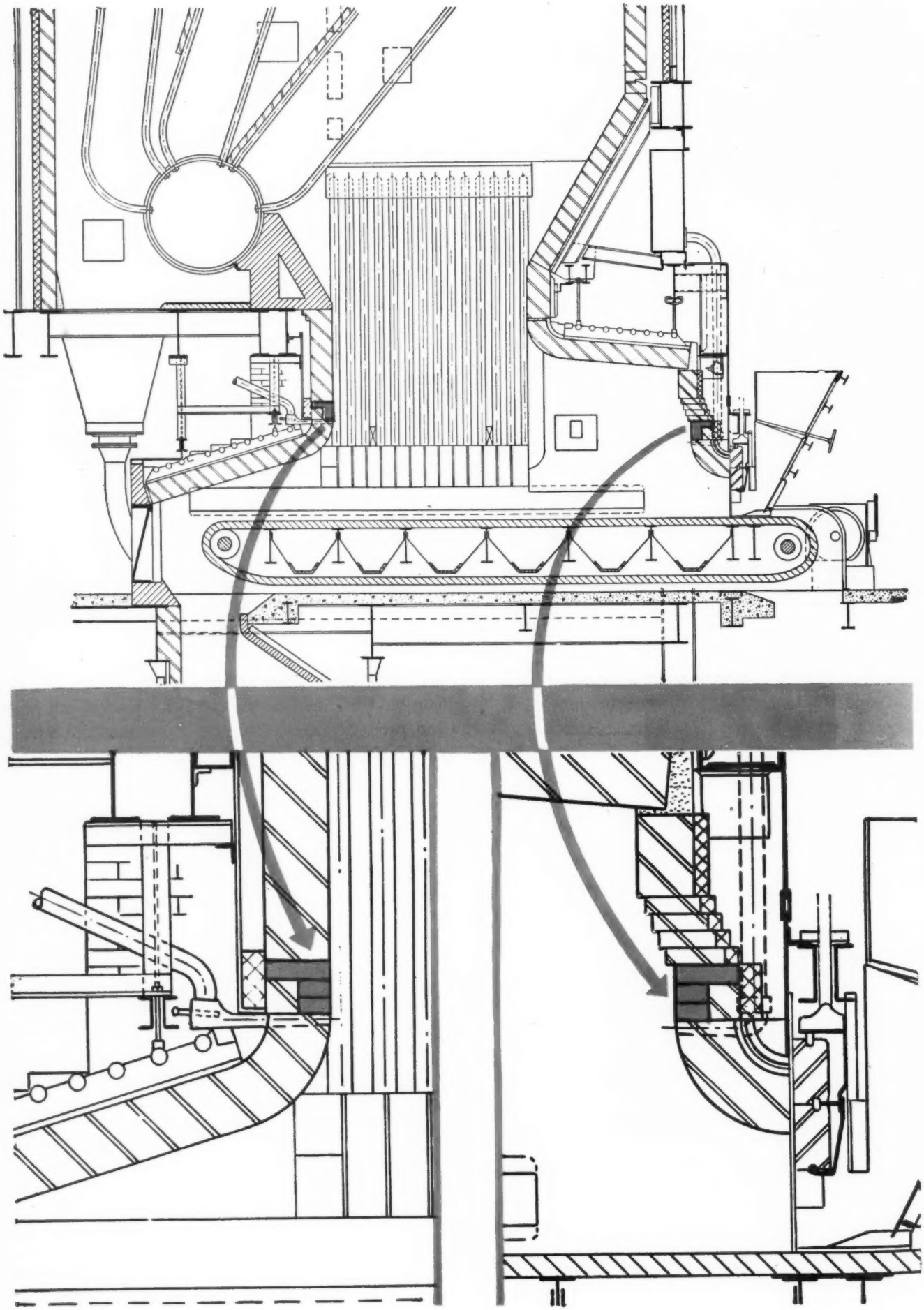


DOING A JOB AT ANOTHER "TROUBLE-SPOT"

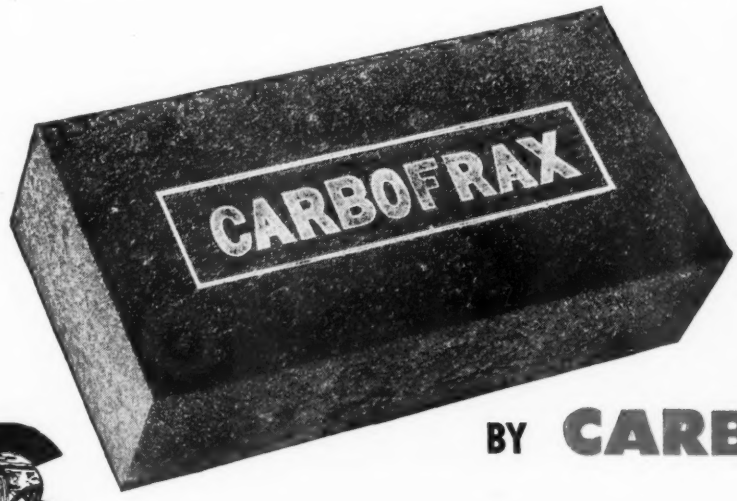
TOUGH PROBLEM SIMPLE SOLUTION

Continuous trouble with uneven secondary air distribution in four large water wall equipped boiler furnaces was this operator's plight.

With ten air nozzles each in the front and rear walls, finger-like slag formed on the clay brick immediately above these openings. The air streams were deflected, preventing uniformly distributed secondary air. Fuel burned unevenly. Costly shutdowns and lowered fuel efficiency resulted.

Installing three courses of CARBOFRAX silicon carbide brick over the air jets, as shown in the illustration, provided the solution to this problem. Clinkers find no anchorage on the smooth surface of the hard, dense CARBOFRAX brickwork. Any slag that accumulates drops off of its own weight. Improved fuel combustion, more continuous on-line service and reduced operating costs have been secured.

Only one of many examples, this experience proves the ability of CARBOFRAX brick to overcome troublesome conditions. Investigate their possibilities for use in your boiler furnaces. A post card to Department E-108 will bring a prompt response. The Carborundum Company, Refractories Division, Perth Amboy, New Jersey.



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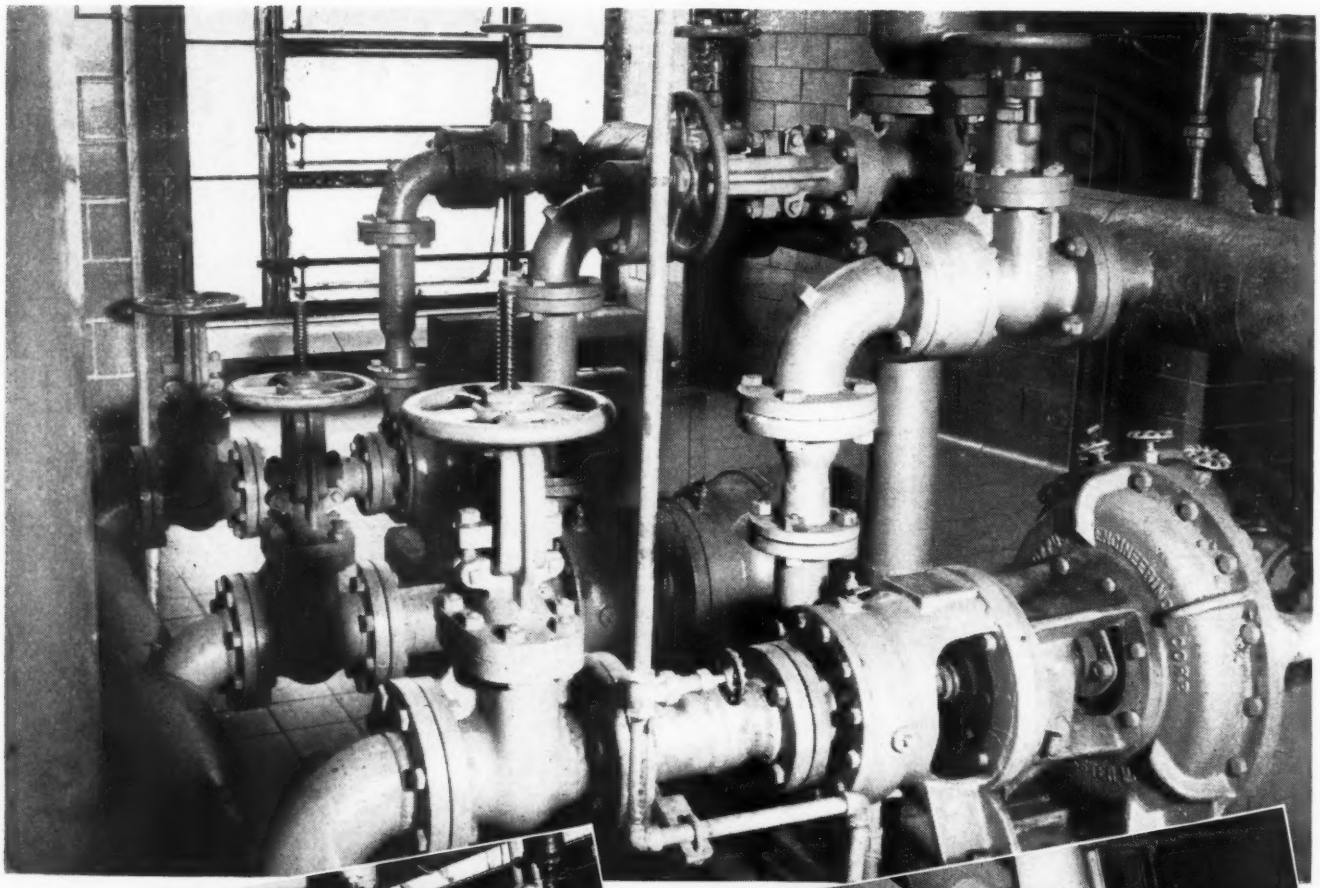
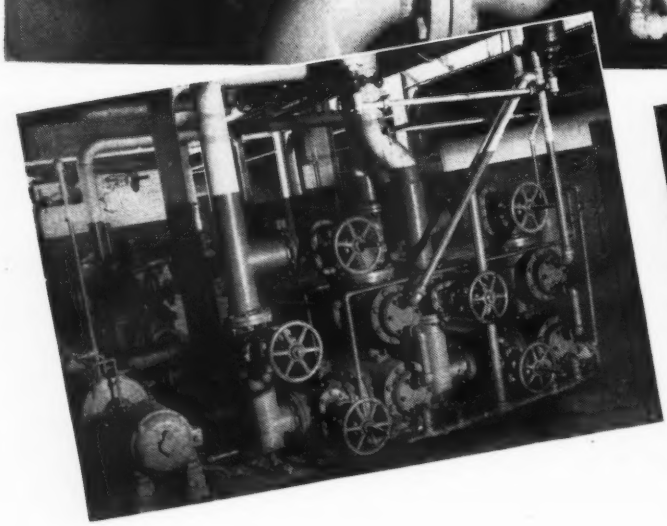
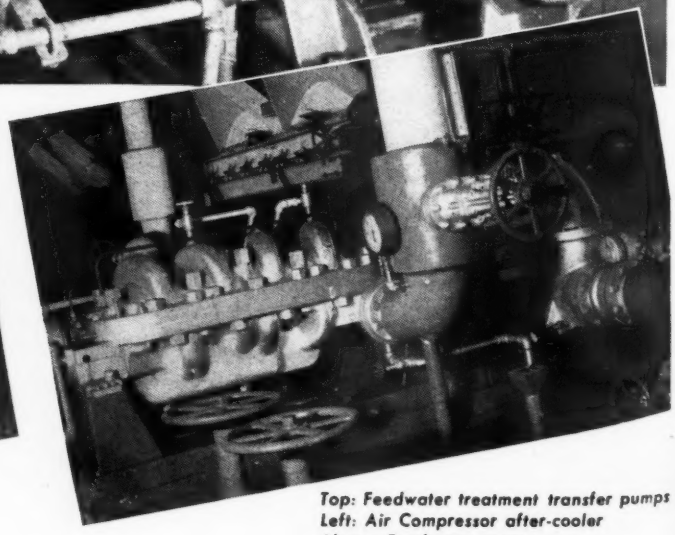
LUNKENHEIMER VALVES

SHERWIN-WILLIAMS



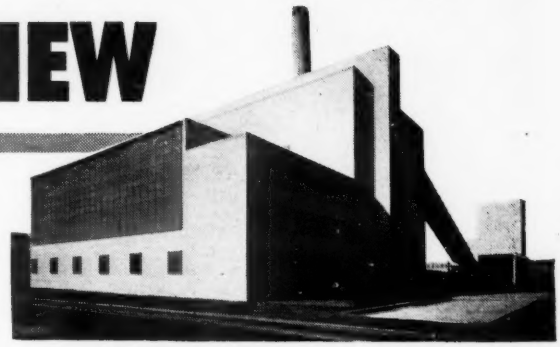




Top: Feedwater treatment transfer pumps
Left: Air Compressor after-cooler
Above: Feedwater pumps

Through **LUNKENHEIMER VALVES . . .**

SELECTED FOR NEW POWER PLANT

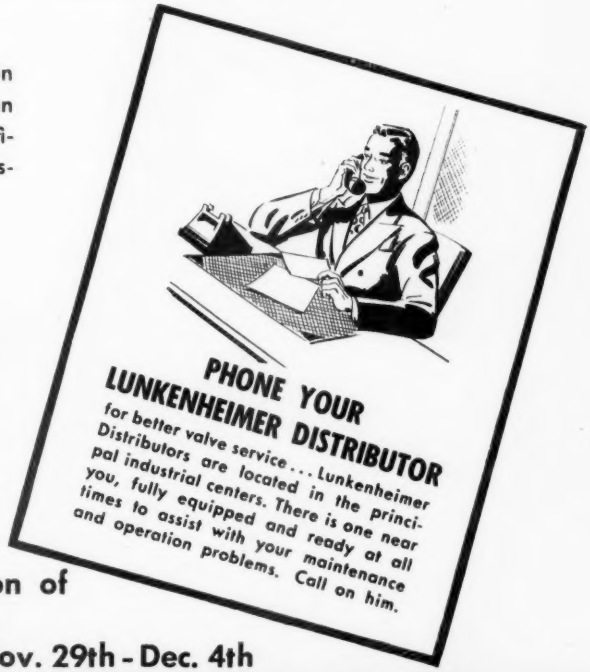


ENGINEERS AND ARCHITECTS:
SCHMIDT, GARDEN, AND ERICKSON, CHICAGO

The new power house at Sherwin-Williams' Chicago plant is the last word in efficiency. From the three, 3-drum, bent-tube boilers to the make-up water treatment system every item of the installation was selected for trouble-free, economical operation. It's only natural therefore, that the list of principal equipment specifies Lunkenheimer Valves.

And so it is in modern plants . . . in a wide cross-section of industry . . . across the country, LUNKENHEIMER VALVES are selected for low-cost operation and dependability. From industrial consultants to operating men, experience with these quality valves proves there is no better valve available.

Whether you're planning a new plant, expansion of present facilities or modernization . . . you can specify Lunkenheimer Valves with utmost confidence. Available through Distributors in all industrial centers.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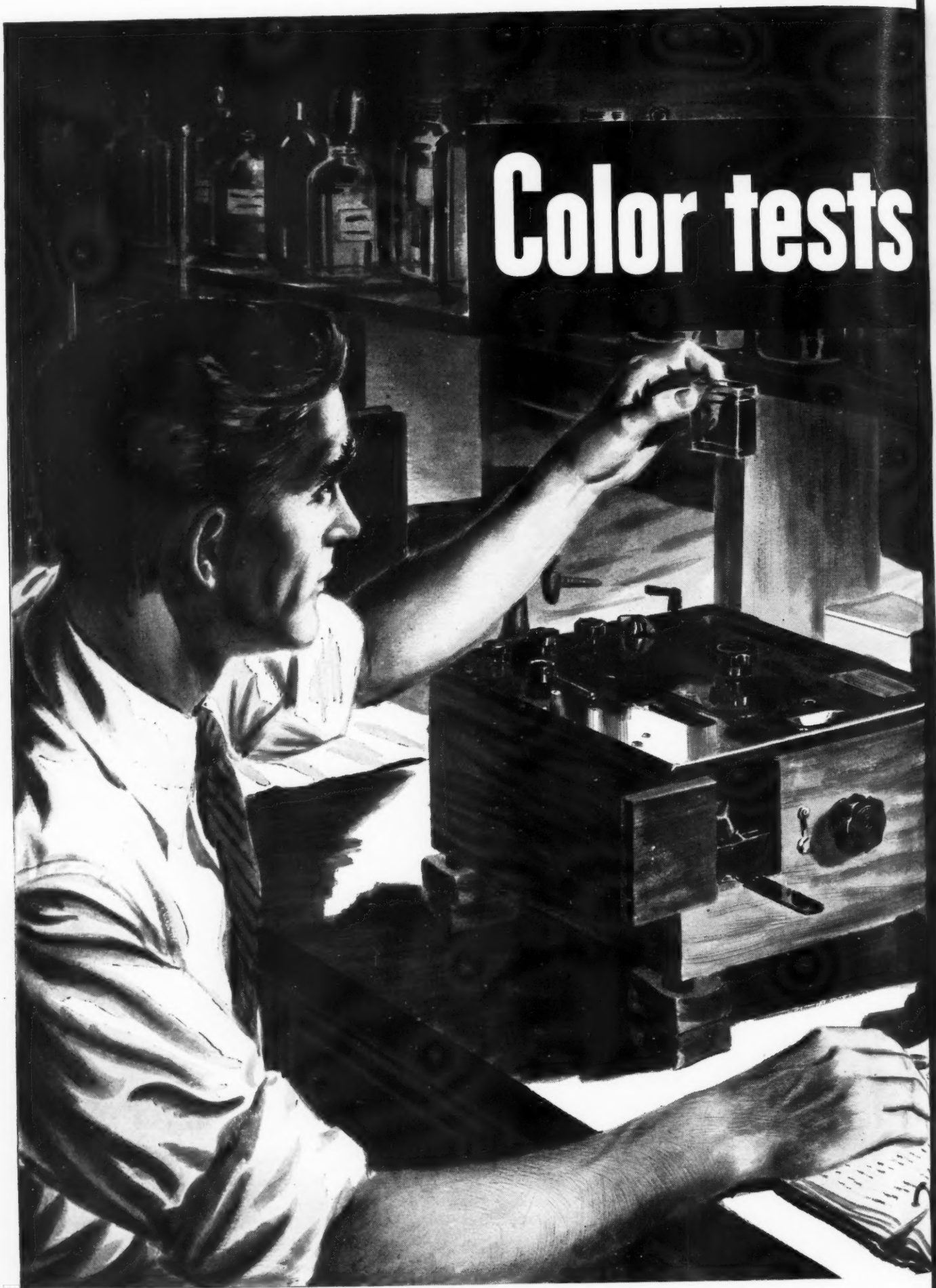
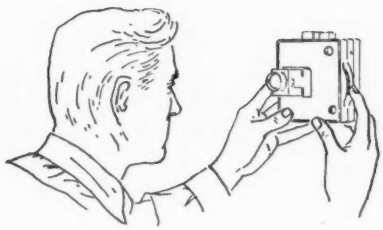
BRONZE, IRON, STEEL, AND CORROSION RESISTANT ALLOY VALVES
AIR DEVICES, LUBRICATORS, AIRCRAFT FITTINGS


Color tests

mean safer boiler water



Colorimetric methods of chemical analysis are not new, but Hall Laboratories has developed a number of these procedures into a convenient system which permits your own plant personnel to determine quickly and accurately the concentrations of phosphate, silica and nitrate in your boiler water.

Essentially, the colorimetric method involves the addition, to a carefully prepared sample of boiler water, of a chemical reagent which reacts with the substance for which you are testing. This reaction produces a characteristic color in the sample, and the density of the color is an accurate index of the amount of this substance in the sample.

For plant use Hall has adapted a simple optical device,* which permits the operator to match the color of the test sample against permanent glass standards corresponding to known concentrations of the substance for which he is testing. Figures on the disc in which the comparison color standards are mounted give a direct reading of the concentration of the test sample.

With this system any boiler operator can determine in a few minutes if he has phosphate present which will inhibit scale formation, a nitrate concentration which will protect against embrittlement—or a silica content in the recommended range.

In developing the procedures described above, objective research techniques, including measurement of color density by means of photoelectric colorimeters, were employed. This method of measurement is regularly used in Hall Laboratories in the testing of boiler water samples from clients, thus providing a continuing check on the accuracy of field analysis.

Steady improvement of test procedures is one reason why hundreds of plants, of all types and sizes, in all parts of the country, are Hall clients.

**This apparatus and other equipment and supplies required for boiler water analysis are available from Hagan Corporation or Buromin Company.*

HAGAN HALL BUROMIN CALGON

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BOILER COMBUSTION CONTROL SYSTEMS
RING BALANCE FLOW AND PRESSURE INSTRUMENTS
METALLURGICAL FURNACE CONTROL SYSTEMS
THRUSTORQ FORCE MEASURING DEVICES

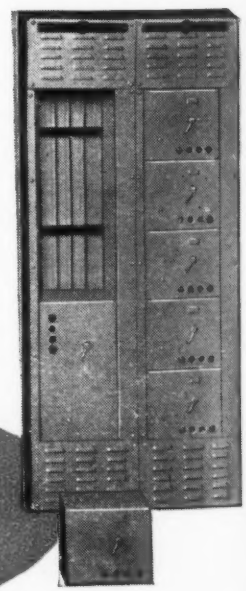
"Clothespin Contact"...

in the new G-E Motor Control Center

marks new advance in starter design

No wiring from starter to bus necessary with this new feature. Simply put the starter in place . . . . and the stabs automatically engage the bus bars in quick, positive connec-

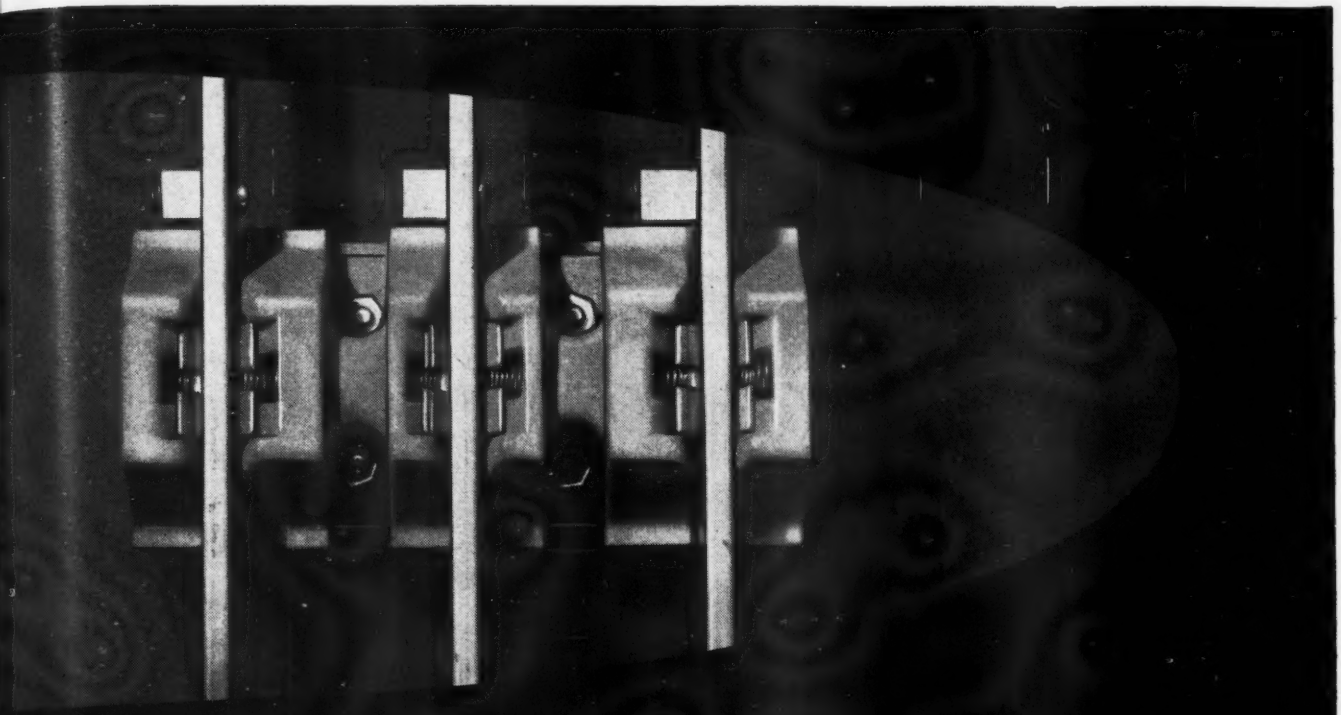
SAVES SPACE This compact centralized motor control system permits you to put all of your control in one spot—simplifies installation, interconnections, and maintenance. Control centers are only 12 inches deep, all wiring is front-connected so units may be placed back to back, in an "L" shape or flush against the wall.



INTERCHANGEABLE

All vertical sections are the same size, all starter units are proportionate. No special engineering is necessary to plan your own G-E control center. To make it even simpler—starter units for motors from 1 to 25 horsepower have the same overall dimensions.

GENERAL ELECTRIC



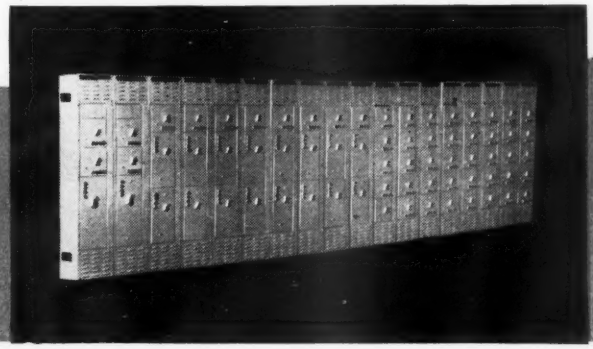
tion. For emergency handling, the starter can be removed without de-energizing the power bus after a simple removal of the supporting bolts.

PLAN YOUR OWN G-E MOTOR CONTROL CENTER

Contact our sales engineer at the nearest G-E office for copies of an easy-to-use planning chart—or write us for bulletin GEA-4979 which contains additional information. ***Apparatus Dept., Section 676-263, General Electric Company, Schenectady, New York.***

P.S.

TO METHODS MEN, ELECTRICAL CONTRACTORS, CONSULTANTS: Have you thoroughly investigated the many applications of low-cost baking, drying and heating with clean, efficient infrared lamps? See G.E.'s MORE POWER TO AMERICA program on the application of infrared in manufacturing. The color slidefilm shows many applications and suggests others; a technical manual supplements the film. Ask your electric utility or G-E representative today for a showing.



For Best Results: Install CRYSTOLON Brick in Boiler Furnaces

The drawings and explanation below are based upon recent installations of Crystolon (Silicon Carbide) brick in boiler furnaces. Results have been completely satisfactory when the directions given here were followed.

Crystolon brick best demonstrate serviceability where there is need of uninterrupted peak operation. Produced at high temperatures these brick are particularly resistant to extreme heat. Their hardness makes them resistant to the abrasive action of ash and the motion of the fire bed.

The surfaces of Crystolon brick are sufficiently dense to prevent molten ash from taking hold by penetration and this same density enables them to resist the erosive action of slag.

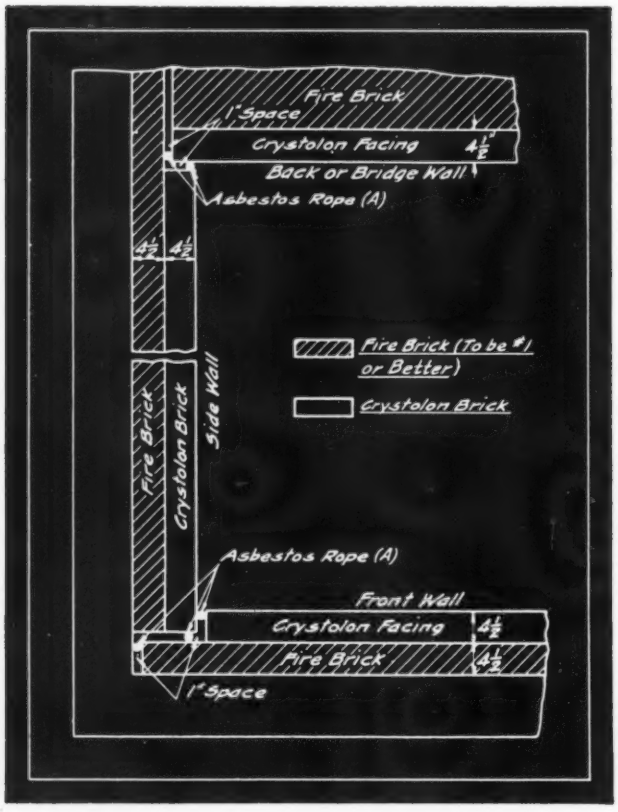


FIG. 1 *Typical Setting Showing Expansion Joints (A)*

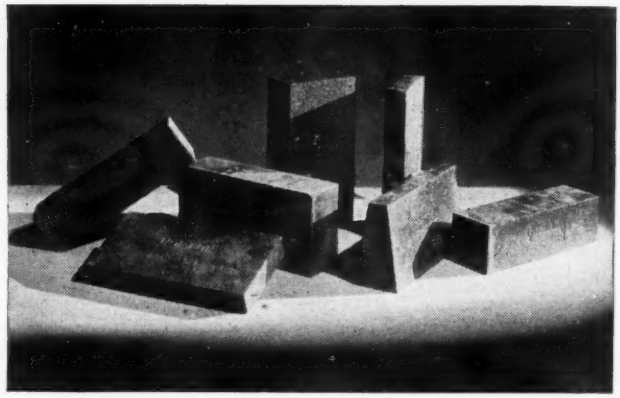


FIG. 2 *Crystolon Brick for Boiler Furnaces*

Other types of refractory brick often necessitate shutdowns or down-time to remove the clinker. While the clinker may sometimes adhere to Crystolon brick to a limited extent, these brick are sufficiently rugged to withstand the rather rough barring action that is commonly used to knock off the clinker.

Super refractory brick although costlier than ordinary fire brick actually give more economical service through reduced maintenance time and longer life.

It is advisable to use the same construction in the bridge wall as is shown (Fig. 1) for the side wall when Crystolon brick are used.

In cases where it may not be convenient to put in expansion joints as shown (see A, Fig. 1), expan-

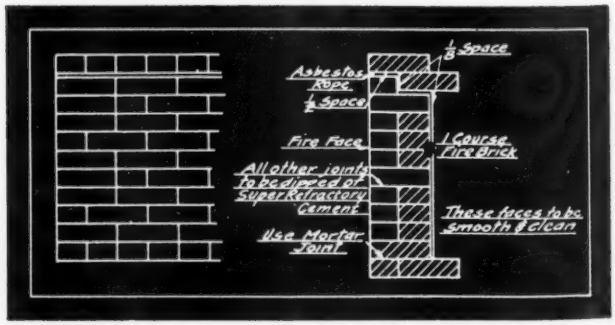

⅛ Space
Asbestos Rope
¼ Space
Fire Face
1 Course Fire Brick
All other joints to be dipped of Super Refractory Cement
These faces to be smooth & clean
Use Mortar Joint

FIG. 3 *Construction Using from 9 Courses up to 4' of Crystolon Brick*

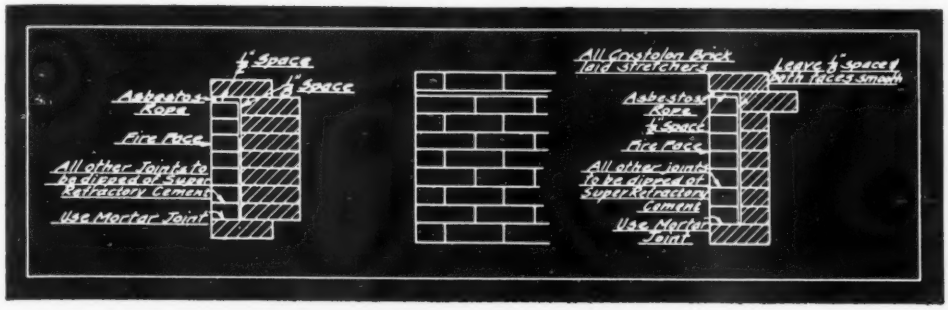


FIG. 4 *New Construction (left) and Repairing Old Construction (right) Where 7 Courses or Less Are Used*

sion can be taken care of by leaving $\frac{1}{16}$" to $\frac{1}{8}$" open joint between each brick in the stretcher courses or every second brick in a header course. In any case, expansion allowances must be made. A good rule to use is approximately $\frac{1}{8}$" expansion to 15" of Crystolon brick in the wall.

For best results, not less than five courses of Crystolon brick should be used in any boiler furnace except in cases where exceptionally thin fire beds are carried and peculiar conditions of operation might justify the use of fewer courses.

In general, five to nine courses are used depending on the type of stoker, size of furnace, thickness of fuel bed carried and rating at which boiler is to be operated. If too few courses are used, there is danger of a slag curtain building down from the fire brick above and interfering with the efficiency of the Crystolon brick.

Always use a super refractory cement* for laying up the Crystolon brick. A dipped joint is best in laying Crystolon brick, unless otherwise specified. The brick should be hammered down tightly to make as nearly a face-to-face joint as possible. *Do not use ordinary fire clay or fire brick cements nor any of the groups known as air-setting or air-hardening cements in contact with the Crystolon brick.*

*Send for Norton Refractory catalogs: Cement No. 863-Crystolon Brick No. 862.

In the center retort, side-dump type of stoker the Crystolon brick should be started 3" below the nose of the dump plate.

In the multiple retort type of underfeed stoker the Crystolon brick should start at the grate line and follow the slope of the stoker, using a few more courses of Crystolon brick in the side wall toward the rear of the stoker. It is well to use standard jamb or bull nose and arch brick to build around the rear inspection door.

In the chain grate type of stoker the Crystolon brick should be laid directly on the side wall bed plate or in any case should start slightly below the top of the chain grate. In the case of one type of Cox stoker now in use a special Crystolon brick is employed with a $\frac{1}{2}$" cut-out which fits directly over the side wall plate.

In hand-fired boiler furnaces it is common practice to start the Crystolon brick an inch or two above the top of the grate.

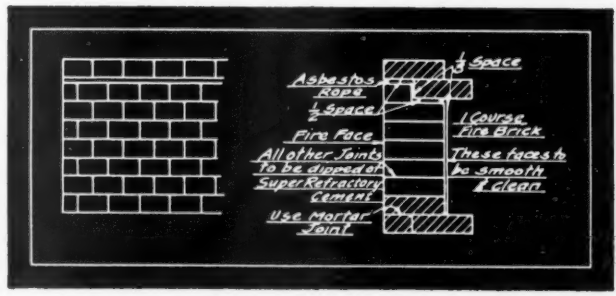

½ Space
Asbestos Rope
½ Space
Fire Face
All other Joints to be dipped in Super Refractory Cement
Use Mortar Joint
1 Course Fire Brick
These faces to be smooth & clean

FIG. 5 *Construction Using 9" Crystolon Wall All Headers up to 4' in Height*

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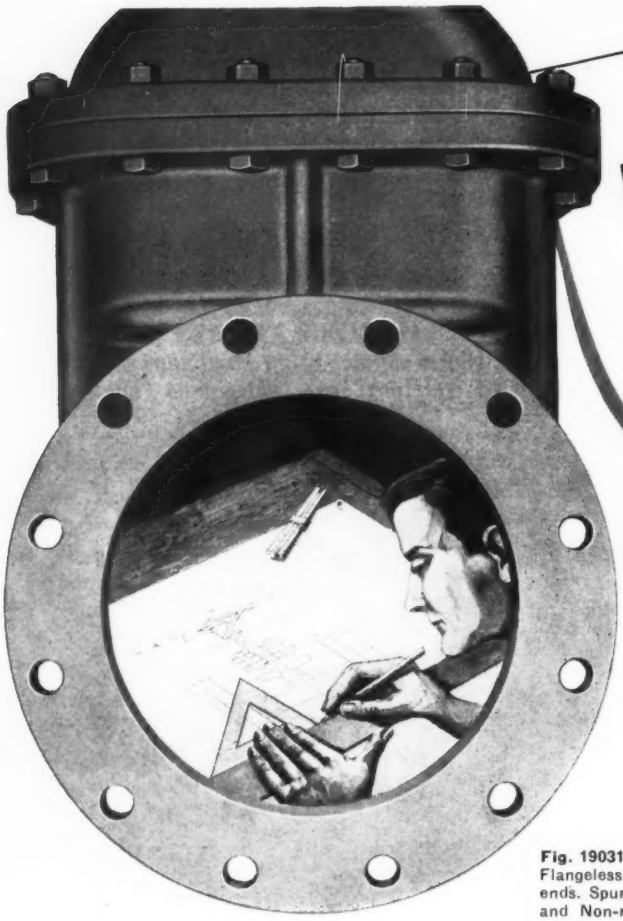

Fig. 19031 W. E.—Class 900 pound Cast Steel Flangeless Bonnet Globe Valve with welding ends. Spur gear operated. Stellite faced. Gate and Non-return Valves are also available in this flangeless bonnet design.

Fig. 1561 W. E.—Class 150-pound Cast Steel Swing Check Valve with welding ends and bolted cap. Disc has ample lift to permit full, straightway, unobstructed flow through valve body.

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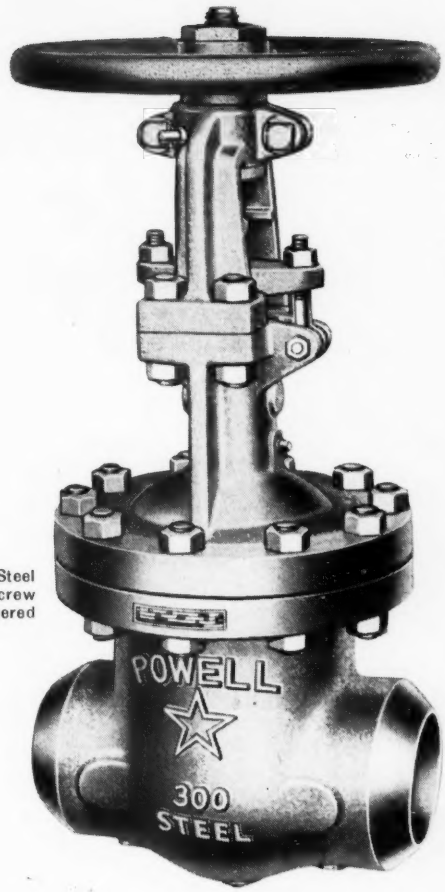

Fig. 3003 W. E.—Class 300-pound Cast Steel Gate Valve with welding ends, outside screw rising stem, bolted flanged yoke and tapered solid wedge.

Fig. 1303 W. E.—Class 1500-pound Cast Steel Gate Valve with welding ends, outside screw rising stem, bolted flanged yoke and tapered solid wedge.

Fig. 375—200-pound Bronze Gate Valve with screwed ends, inside screw rising stem, union bonnet and renewable wear-resisting "Powellium" nickel-bronze disc.

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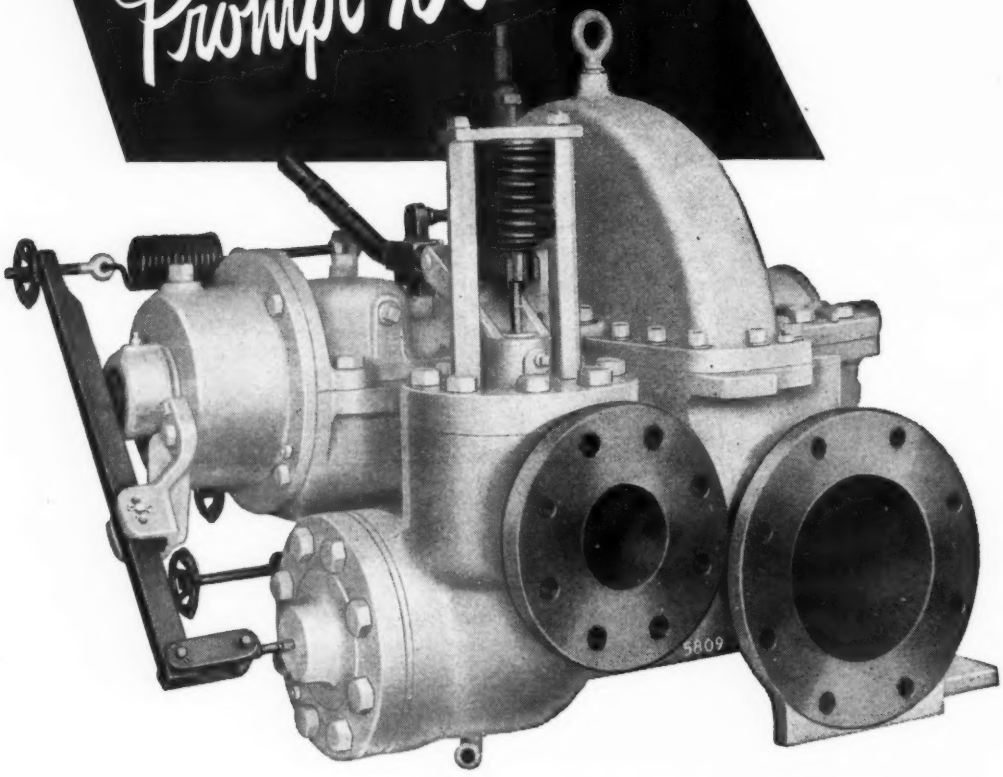

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SPECIAL SECTION

1948 MODERN PLANT SURVEY—Technical highlights of central-station and industrial construction..... 71

CENTRAL-STATION TRENDS—Charts summarize engineering data reported by 230 utilities..... 72

STATION P—Pacific Gas and Electric Co's 215,000-kw extension is designed for quick load pickup..... 74

STATION C—Strictly unit construction marks Braddock Light and Power Co's Alexandria plant..... 77

LINCOLN BEERBOWER STATION—Oklahoma Gas & Electric Co adds 25,000 kw at Ponca City..... 80

LANSING STATION—Carefully worked out design yields good performance for Interstate Power Co.... 83

PERMIAN BASIN STATION—Outdoor plant of Texas Electric Service Co has unusual features..... 86

ESSEX STATION—Public Service of New Jersey has second 1000-F unit in U. S.—it's rated 100,000 kw.. 89

CENTRAL-STATION TABULATION—Technical details on 230 installations being designed or built.... 92

INDUSTRIAL-POWER TRENDS—Steam-generating facilities dominate industrial expansion programs... 98

STEEL CO OF CANADA—New 500,000-lb-per-hr boiler plant designed to handle steel-mill fuels..... 100

SPRINGS COTTON MILLS—Modern process-power installation serves bleachery-division operations..... 102

TEXAS CO—Eagle Point Works supplied by high-pressure plant of flexible, efficient layout..... 104

NORTON CO—Abrasives manufacturer expands power-service facilities with 50,000-lb-per-hr unit.... 106

PULLMAN STANDARD CAR MFG CO—Extensive modernization yields integrated, efficient plant.... 108

MANSFIELD TIRE AND RUBBER CO—Boiler-plant extension designed for possible h-p operation..... 110

MICHIGAN STATE COLLEGE—New power plant connects to old one across river..... 112

CARBORUNDUM CO—Another abrasives manufacturer extends and modernizes steam facilities..... 114

H-P INDUSTRIAL TABULATIONS—Engineering features of industrial plants 200 psi and over..... 116

L-P INDUSTRIAL TABULATIONS—Engineering features of industrial plants below 200 psi..... 120

HYDROELECTRIC TRENDS—Summary of year's important developments in U. S. and Canada..... 123

GOVERNMENT HYDRO PROJECTS—Table lists projects of governmental agencies, map locates them.. 126

HYDROELECTRIC TABULATIONS—Engineering highlights of hydro developments on order or building.. 130

DEPARTMENTS

Power engineer's notebook of plant-tested ideas... 134

Solving problems from the power plant..... 138

Technical briefs 142

Engineer's bookshelf 144

What's new in plant equipment..... 146

How to figure unburned carbon..... 154

News of the power field..... 156

Service page: new equipment, technical literature..206A

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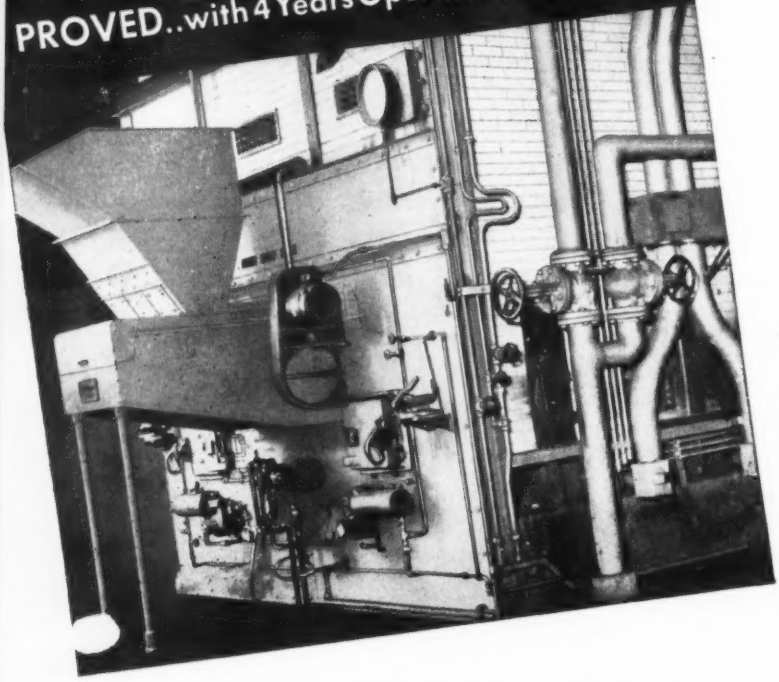

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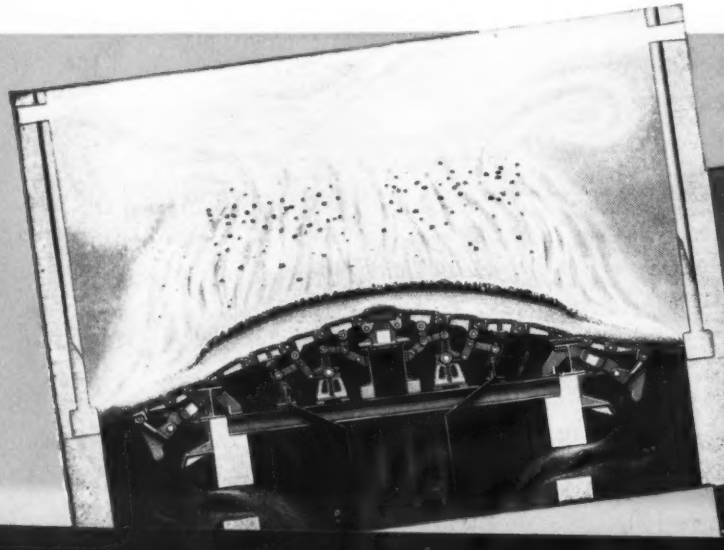

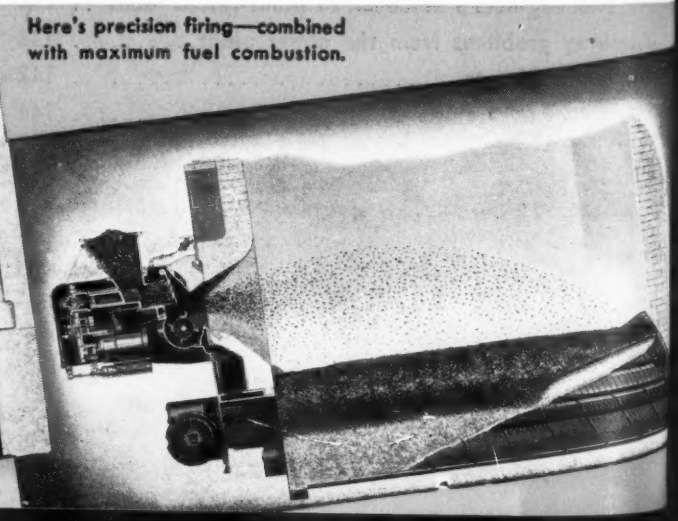

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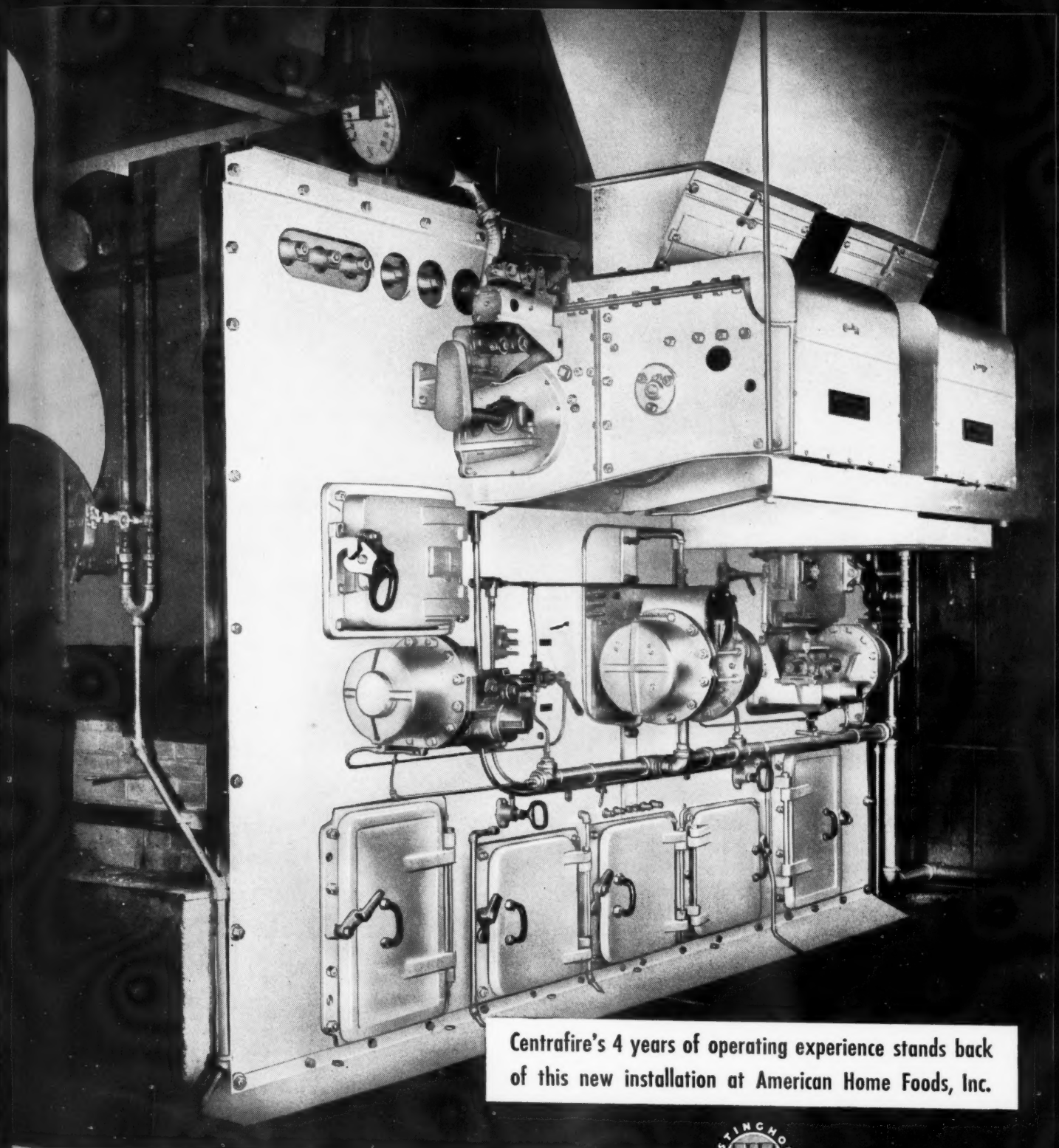
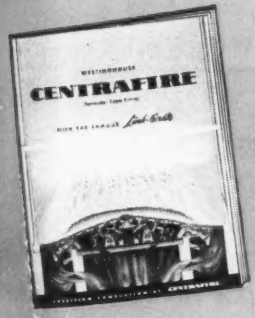


Centrafire's 4 years of operating experience stands back of this new installation at American Home Foods, Inc.



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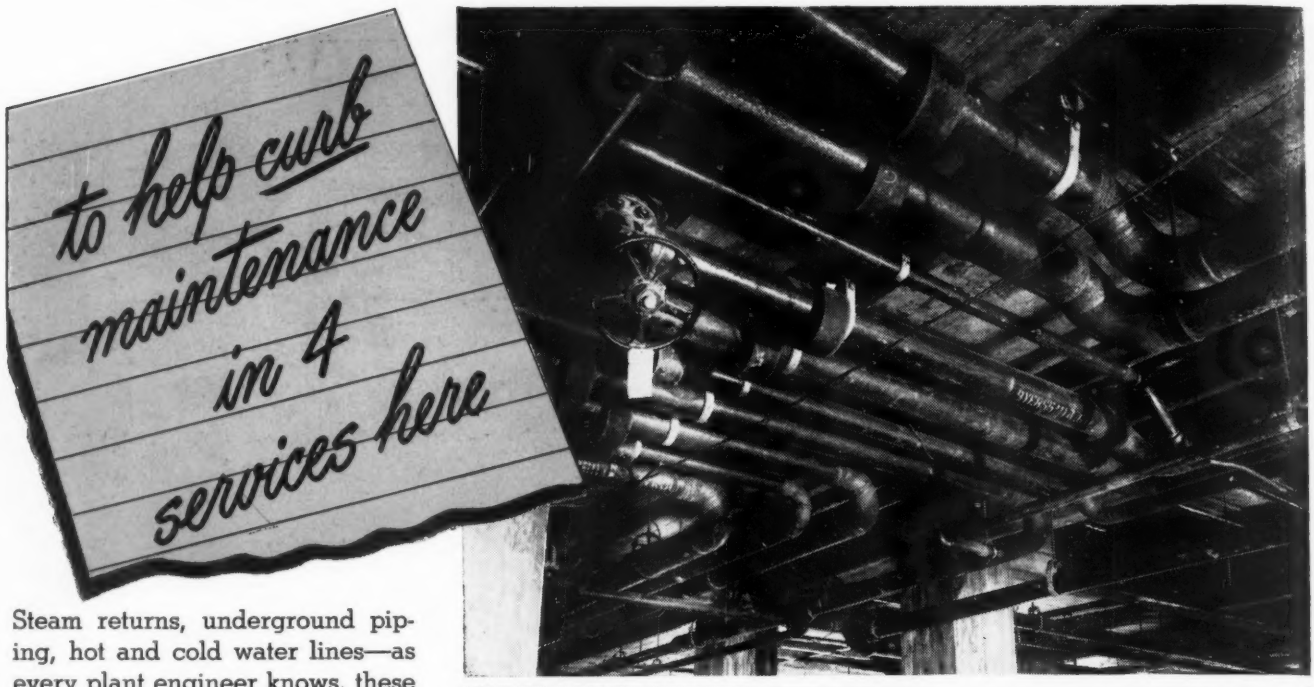

Steam returns, underground piping, hot and cold water lines—as every plant engineer knows, these services face severe corrosion hazards, and only a durable pipe material can protect against early failure and expensive replacement.

In writing the mechanical specifications for an addition to Mercy Hospital, Springfield, Ohio, this maintenance threat was forestalled by extensive use of wrought iron. All the returns, all underground piping except drains, and all hot and cold water lines larger than 2½-inches, were specified "wrought iron." Byers Wrought Iron pipe, in sizes from 3-inch to 8-inch, was utilized. A portion of the installation is shown in the picture. Maguolo & Quick, successors to P. M. O'Meara & Associates were the architects. T. J. Connor Company Inc., handled the plumbing and heating work.

SELECTION METHODS

If you are contemplating new construction, or extensions or replacement of existing piping services, you'll find it profitable to check up on the performance of wrought iron. Water varies widely in its corrosive characteristics, and selection of piping material should be preceded by a careful study, which we will be glad to help you make. Steam return lines, however, are invariably corrosive . . . and wrought iron has been so uniformly successful in combating the attack that it should be given first consideration.

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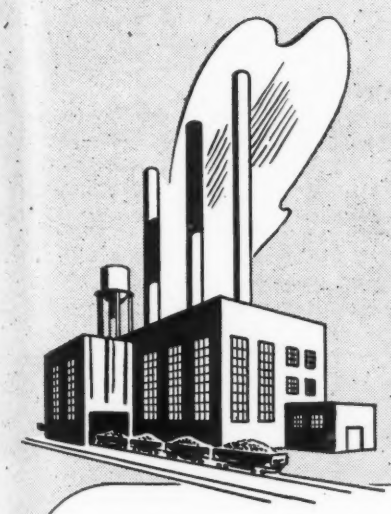


Technical highlights of utility and industrial power-plant construction to meet unprecedented load growth; tabulated engineering features of over 700 new steam and hydroelectric stations

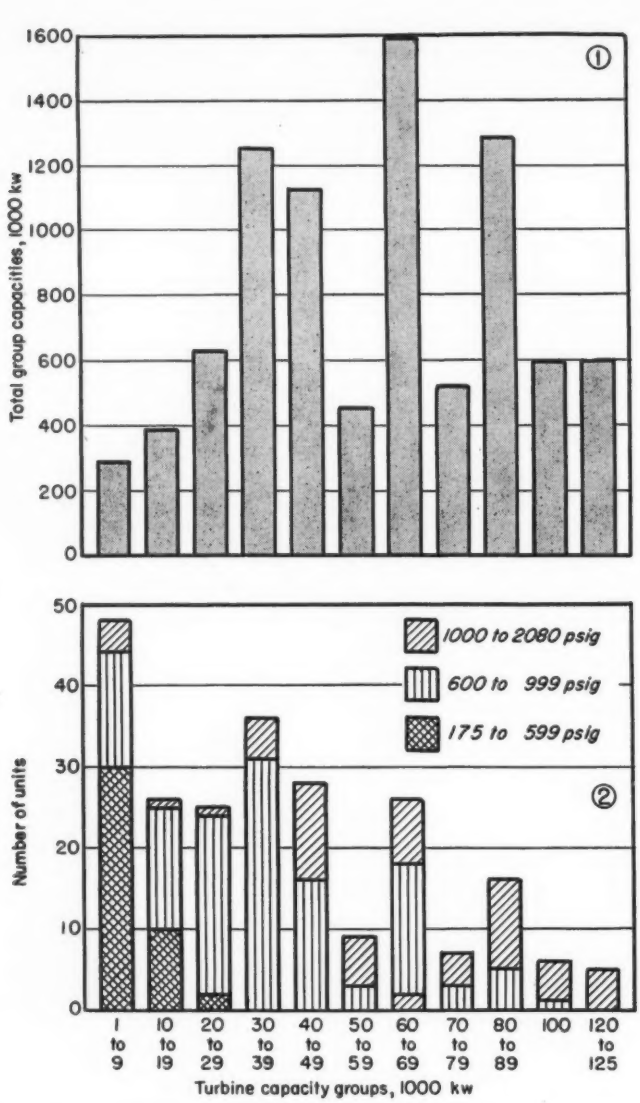
SINCE THE WAR'S END pitched us into the greatest wave of construction the industry has yet known, power engineers have had little time for anything but their own immediate problems—keeping existing machines rolling and putting new kilowatts on the line as fast as possible. Yet from the hundreds of new plants being built, or old ones being extended or modernized, much can be learned. Hence this special section—POWER's 69th.

Here we have tried to dig out answers to the questions you would ask if you had time to sit back and examine current practice in power-plant design. As a basis, we started with POWER's continuing survey of new plant installations. The returns proved exceptionally good, so we are able to tabulate for your reference the technical highlights of over 700 plants now being designed or built.

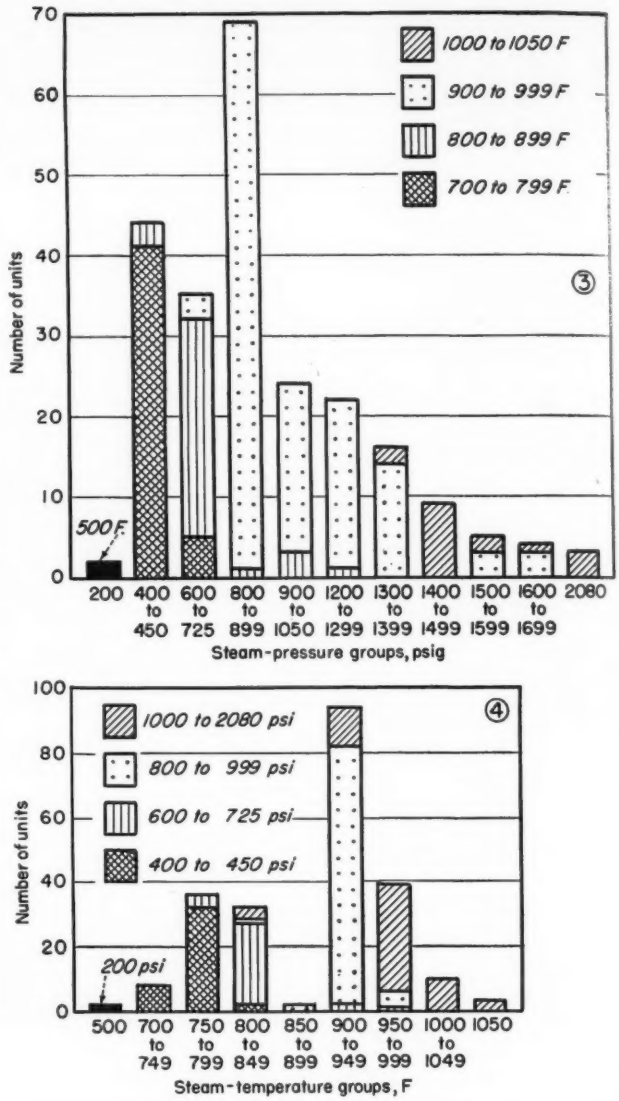
For the benefit of busy engineers we have analyzed this mass of data and summarized in charts and words the principal design trends in both central-station and industrial installations. In these pages you will see at a glance what other engineers have done about pressures, temperatures, capacities, heat-release rates, fuels, firing equipment, boiler auxiliaries, fan and pump drives, etc.

To build some flesh on these bare bones of data, this special section also includes concise descriptions of six central stations and eight industrial power plants. We selected these to give, as far as possible, a broad cross-section of today's practice as it is influenced by geographical location, plant size and type, nature of fuels available, and type of load served. Comprehensive equipment tables show the specific choices made by individual designers.

The current high level of construction and operating costs, which is likely to continue, puts tremendous emphasis on plant design—layout simplification for lower first cost, heat-balance ingenuity for high economy, and sound equipment selection for reliability and low maintenance. Power engineers everywhere are burning the midnight oil on these problems and working out their own solutions. This special section is our report to you on what others have done—use it as a guide in working out the answers for your plant.



GROUPING BY CAPACITIES shows the 60- and 80-mw turbines contribute largest blocks of kw; units under 10 mw lowest kw



PRESSURES IN THE 800s are most frequently applied while temperatures ranging from 900 to 949 F strongly predominate

Survey Spots Utility Design Trends

▶ ROCKETING NEEDS for more generating capacity are strikingly shown by the record number of returns received in POWER's present steam central-station survey. In the tables on pp 92-97 are broad details of 233 units installed since January 1947 and projected up to 1951. These units total close to 8.5 million kw, representing about 55 to 60% of announced expansions. POWER's 1947 Survey, published in the June, 1947 issue, reported on 79 units representing almost 3.5 million kw for the same period as the current survey. Efforts were made to avoid reporting the same installation in both surveys. The two studies together give information on about 75 to 80% of new units.

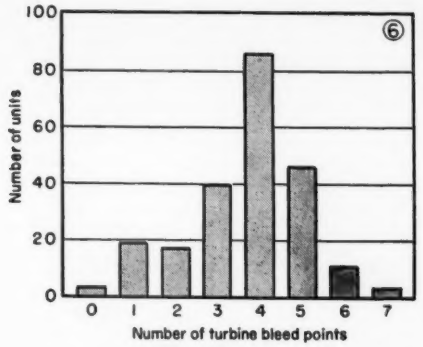
New Practices. The tremendous expansion all systems are experiencing, coupled with inflated prices, leads naturally to emphasis on designs that will hold down over-all costs. About two-thirds of the reported units will use steam pressures of 800 psig and above, and temperatures of 900 F and above. Only an insignificant number of boilers do not use either or both economizer and air heater; these are in small municipal plants.

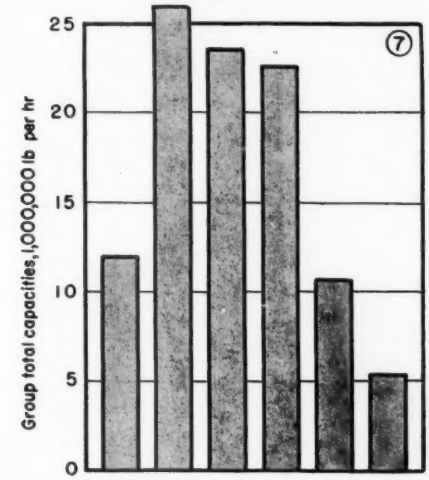
The predominant use of one boiler per turbine directly reflects the cost-cutting aim as well as the increased reliability of equipment operation. No information was collected on the number of pure single-unit installations. Probably most of these units reported are interconnected with others in the same station at the steam header or the boiler-feed header.

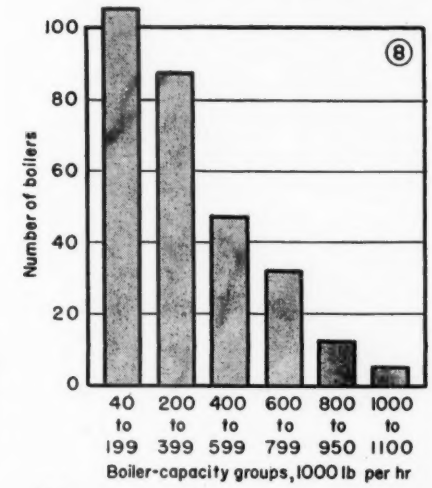
The trend to utilization of four bleed points and more continues. Most of the plants using less than four are small, operating at pressures of 450 psig and below. About 65% of the reported number of boilers will have full-load heat release rates less than 25,000 Btu per cu ft per hr and 45% will be less than 20,000 Btu. While this factor depends largely on the furnace design it nevertheless shows an allowance for varia-

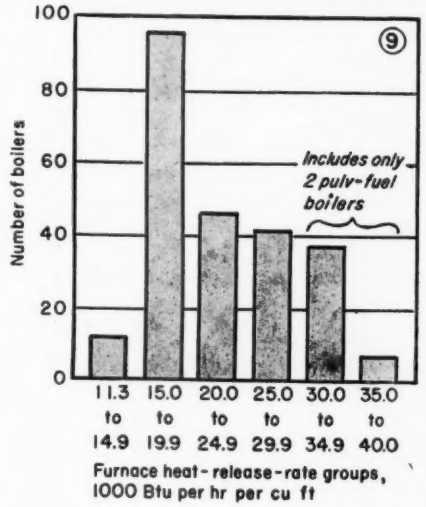
Number of steam generators with auxiliary heating surface
0 25 50 75 100 125
Economizer and air heater
Air heater only
Economizer only
No auxiliary surface
Number of each air-heater type utilized
0 25 50 75 100 125
Tubular
Regenerative
Plate
Number of boilers having various firing arrangements
0 25 50 75 100 125
Pulverized coal only
Oil only
Gas only
Pulverized coal and oil
Pulverized coal and gas
Pulverized coal, oil and gas
Gas and oil
Spreader stoker
Traveling grate
Underfeed stoker
⑤
Number of units with one, two and three boilers per turbine
0 25 50 75 100 125 150 175
1 boiler per turbine
1.5 boiler per turbine
2 boilers per turbine
3 boilers per turbine

COAL WILL BE MOST USED FUEL with almost universal application of air heaters; note high use of 1 boiler per unit









tions in fuel quality to the poorer side.

The present group of installations includes eight topping turbines, only a small percentage of the entire group of 233; last year's survey had five toppers out of 81 units.

A definite try for increased over-all economy appears in the 12 reheat installations reported, most of them at initial and reheat temperatures of 1000 to 1050 F, reheat being applied for its better heat rate rather than moisture control at turbine exhaust.

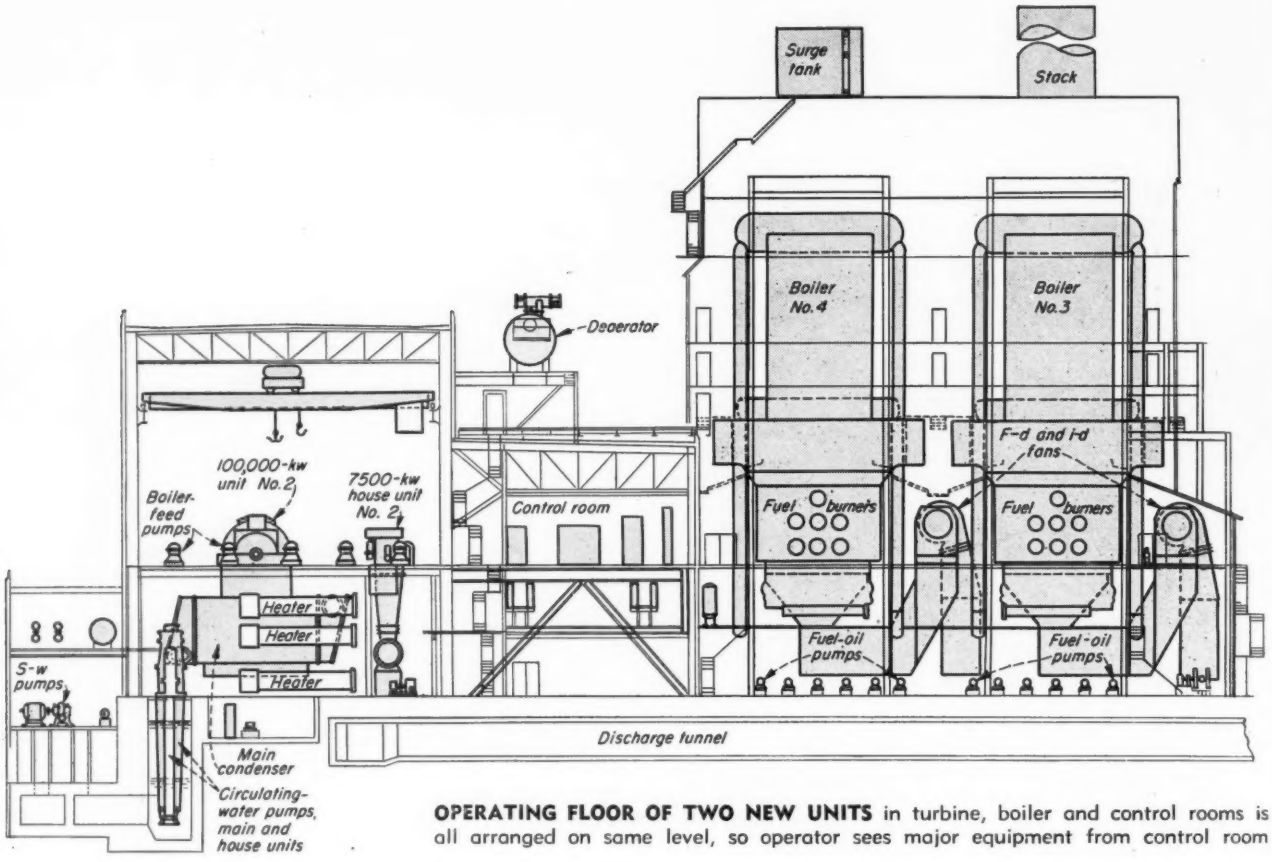
Of 167 turbines 20,000 kw and larger, only three are air cooled, the remainder using hydrogen. Of a total of 233 units, five are cross-compound with the h-p rotor turning at 3600 rpm and the l-p rotor at 1800 rpm; there are 17 units running at 1800 rpm and one at 1500 rpm, rest operate at 3600 rpm.

By a vast majority most of the installations will use electrically driven auxiliaries, with perhaps a standby turbine-driven feed pump. Only 16 have turbine-driven pumps exclusively. For speed control on fans and pumps a total of 80 hydraulic couplings and 25 magnetic couplings were reported.

Radical Departures. Projected installations that are radically different and will be watched with interest by the power field are (1) the mercury-steam station being installed by the Public Service Co of New Hampshire (2) the simple-cycle gas turbine with exhaust heat recovery being installed by the Oklahoma Gas and Electric Co. The first installation will consist of two "standard" 7500-kw mercury turbines and boilers supplying steam to a 25,000-kw steam turbine, making a total unit capacity of 40,000 kw.

The gas turbine reported in Sept 1948 POWER, pp 64-71, is a 3500-kw unit working with existing steam-station heat balance to raise station capability over 6000 kw and improve total heat rate.

ADDITIONAL DATA appear in Fig. 6-9 at right; note particularly the conservative heat releases in Fig. 9, showing provision for changes in coal qualities



OPERATING FLOOR OF TWO NEW UNITS in turbine, boiler and control rooms is all arranged on same level, so operator sees major equipment from control room

STATION P

Pacific Gas and Electric Co erects extension in San Francisco that overshadows existing plant. Fast load-pickup needs dictate many design features of two new units

► As part of the vast system that serves much of the state of California, with hydro stations as the predominant energy source, the duties of the new units at Station P differ from most steam plants. The 215,000-kw extension, scheduled to go into operation in late 1948, will at times run at low loads, and yet may be called on to develop full load in a matter of 20 to 30 seconds. Equipment must be properly selected for this service; for instance, four steam generators are better than two; fairly high steam pressure of 1380 psig proves more favorable than the lower pressures; the seven oil burners serving each boiler furnace have a 20:1 load ratio. Attemperators in the lower boiler drums serve to prevent excessive thermal shock on the turbines during periods of quick pickup.

The forced- and induced-draft fans and four of the boiler-feed pumps will operate at all times at full speed, ready for full-capacity demands. Automatic controls provided wherever possible insure rapid functioning of all unit elements.

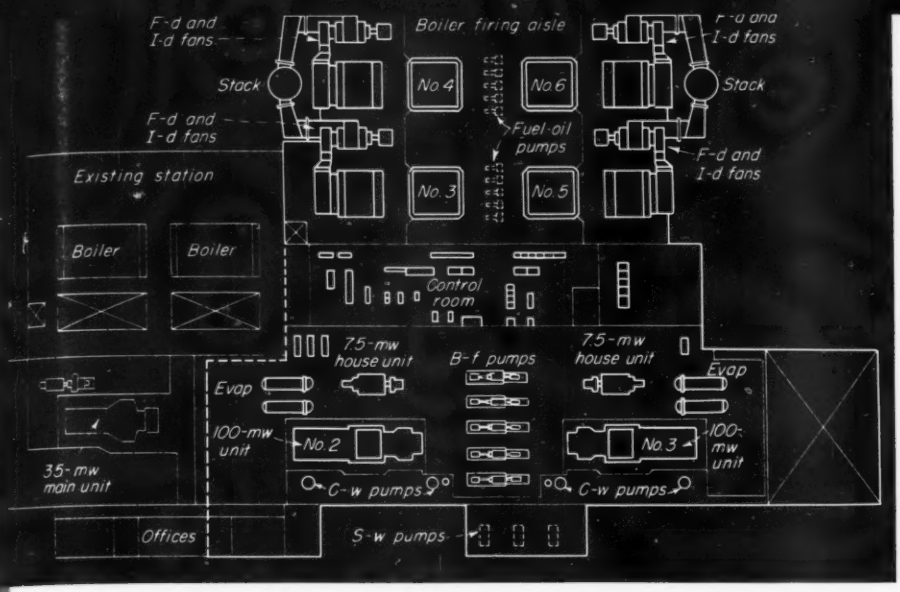
Centralized Control. The control room features the general layout; it puts the operator at the key point close to house turbines, boiler feed pumps and main turbines on one hand, and the boiler-room firing aisle on the other. The fundamental plan places the main turbine-generators lengthwise in the turbine room with the steam ends facing one another. This permits a convenient symmetrical arrangement of main steam piping from the steam generators.

Auxiliary equipment is divided between two levels. Boiler-feed pump units and feedwater evaporators are in the turbine room on the operating floor, while all other auxiliaries are on the ground floor between the condensers and the boilers. Salt-water cooling pumps are in a pump house adjacent to the wall of the condenser area.

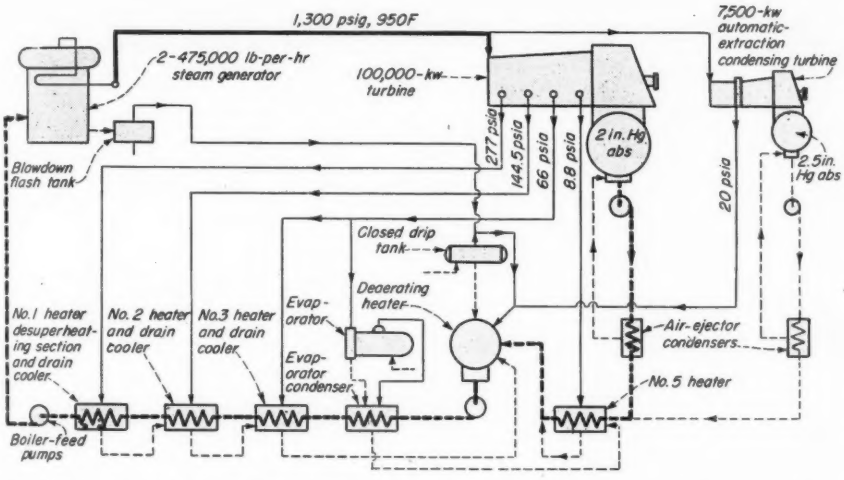
Turbine Room. Two 100,000-kw units with corresponding 7500-kw house turbines are being installed. The tandem-compound double-flow main turbines, as well as the automatic-extraction condensing house turbines, use throttle steam at 1300 psig and 950 F. Four bleed points supply steam to four closed feedwater heaters and an evaporator.

The house units provide an independent electric supply for station auxiliaries, and will always be in operation supplying extraction steam at a constant 5-psig pressure to the deaerating feedwater heaters. Normally, each deaerator takes its steam from the house unit of the corresponding main unit. Whenever moderate amounts of excess 5-psig steam become available it can be inducted in the bleed opening of the house unit.

The single-pass main condensers have 40,000 sq ft of surface in aluminum-brass tubes arranged in divided water-boxes. Steam-jet air ejectors serve the condensers, which have deaerating and storage-type hotwells. Each main unit has two 1500-gpm condensate pumps.



MAJOR APPARATUS OF TWO NEW UNITS face each other about a center line running through boiler firing aisle. Boilers are semi outdoor; most of plant is housed



UNIT HEAT BALANCE INCLUDES automatic-extraction condensing house turbine that supplies the bulk of deaerating steam, absorbs excess l-p steam at low loads

Two gravity tunnels supply circulating water from San Francisco Bay and are sectionalized so any portion may be cleaned with only one main unit out of service. Condenser water discharges through concrete tunnels. Two vertical circulating-water pumps serve each main condenser at the rate of 40,000 gpm each when operating in parallel at 495 rpm against a total head of 31 ft.

The single-pass house unit condensers have divided water-boxes. Each condenser contains 4000 sq ft of aluminum-brass tubes, the circulating water being supplied by one vertical 9000-gpm pump. Two 170-gpm condensate pumps serve the house units.

The original intake tunnel has been widened to the screen-well entrance. Two larger wells have been added to the existing four wells. Traveling screens operate automatically in response to water differential controls. Both intake tunnels can be used for all units.

Steam Generators. Two radiant boilers with 475,000-lb-per-hr steam rating and 517,500-lb-per-hr steam capability serve each of the two main turbines and their corresponding house units. Steam generators located outdoors have an umbrella roof, but the firing aisle is completely enclosed. This was considered necessary in view of the fog and temperature range prevailing in this area. Each steam generator has a 2-section superheater with intermediate drum-type attemperator, an economizer and a tubular air heater.

Each of the steam generators has one draft-fan unit consisting of one overhung single-inlet forced-draft fan, one double-inlet induced-draft fan and a 2000-hp 4160-v driving motor on a single shaft. These units are on the east side of each boiler at the operating-floor level. The two boilers of each unit are served by a single gunite-lined steel stack, 15 ft 4 in. dia by 200 ft high. Stacks are self-supporting from the ground.

Structure. Steps had to be taken to guard against the effects of earthquake shocks. In the boiler area the footings are tied together by reinforced concrete beams. The building was designed to resist shocks with a seismic factor of 0.2 G, including half of the live loads.

While boilers and fans are essentially outdoors, the remainder of the equipment is fully housed in more or less conventional fashion.

Electrical System. Each of the 13.8-kv 3-phase 60-cycle main generators connects to a step-up transformer bank of three 29,800/37,250-kva single-phase 115-13.8-kv transformers. Each 13.8-kv generator lead is tapped to supply a station-service transformer bank of three 3,334/4,444-kva single-phase 13.8-4.16-kv transformers.

Each main generator has a 300-kw motor-generator set for excitation with direct-connected amplidyne; in addition, there is a spare set for emergency.

The motor-driven station auxiliaries are supplied at 4160 and 480 v. Motors larger than 125 hp are rated 4160 v, the smaller motors 480 v. Two transformer banks and the two house units supply the station auxiliary power. These sources connect to the 4160-v switchgear on the ground floor under the control room. From this same location four metalclad unit substations supply the circuits running to 480-v load-center switchgear at strategic points throughout the plant. Dry-type transformers operating at 480-208/120 v supply the plant lighting system.

A 60-cell 125-v storage battery and two 25-kw battery-charging generator sets provide for circuit-breaker-control circuits, for valve operation and emergency lighting. Distribution switchboard is in the central control room.

A special annunciator signal system consists of banks of large light-type indicators mounted above the various control boards and in the control-room walls between turbine and boiler rooms. These will prove valuable under emergency conditions.

Table of principal power-plant equipment is given on following page.

Acknowledgments. POWER is indebted to M W Carty of Stone & Webster Engineering Corp, and to the Pacific Gas and Electric Co for this article's data.

PRINCIPAL POWER-PLANT EQUIPMENT

Station P of the Pacific Gas and Electric Company

San Francisco, Calif., Units No. 2 and 3

STEAM GENERATORS:

Boilers, 4.....Babcock & Wilcox Co
475,000 lb per hr continuous, 1380 psig, 960 F, 8577 sq ft surf.
Superheater.....Babcock & Wilcox Co
Pendant type, 2 sections, 16,241 sq ft surface
Attemperator.....Babcock & Wilcox Co
Mud-drum tube cluster, 680 sq ft surface
Attemperator control valves.....Manning, Maxwell & Moore, Inc
Safety valves, drum, superheater....Manning, Maxwell & Moore, Inc
Economizers.....Babcock & Wilcox Co
Continuous tube, 6870 sq ft
Soot blowers, 1 set per boiler.....Diamond Power Specialty Corp
450-psig sat steam, two 2-in. mass action ahead of economizer
Burners, 7 per boiler.....Peabody Engineering Corp
Oil and gas, front-wall horizontal, 20:1 firing ratio
Ignitors, 1 per burner.....Peabody Engineering Corp
Gas fired, electrical ignition, manually operated
Primary fuel-oil pumps, 2 per boiler....De Laval Steam Turbine Co
Triple screw, 65 gpm, 1950-ft total head
Primary oil-pump motor drives, 60 hp.....General Electric Co
Secondary fuel-oil pumps, 2 per boiler.....United Iron Works Co
75 gpm, 300-psi constant differential, 40-hp motor drive
Recirculating fuel oil pumps, 2.....De Laval Steam Turbine Co
65 gpm, 1950-ft total head, 47-hp steam turbine drive
Primary fuel-oil heaters.....Griscom-Russell Co
Secondary fuel oil heaters.....Ross Heater and Manufacturing Co
Fuel-oil strainers.....Elliott Co
Forced-draft fans, 1 per boiler.....B F Sturtevant Co, Inc
700,000 lb per hr at 25-in. H_2O, 80 F, on same shaft with i-d fan
Induced-draft fan, 1 per boiler.....B F Sturtevant Co, Inc
810,000 lb per hr at 13.5-in. H_2O, 440 F
Fan drive, 1 per boiler.....Westinghouse Electric Co
2000 hp, 4160 v, 870 rpm, drives both f-d and i-d fans
Air preheater.....Babcock & Wilcox Co
Tubular, 67,600 sq ft
Steam air heaters, 1 per boiler.....Aerofin Corp
Steel stacks.....California Steel Products Co
Ducts and flues.....Western Pipe & Steel Co

TURBINE-ROOM EQUIPMENT:

Main turbine-generators, 2.....General Electric Co
Tandem compound, double flow, 100,000 kw, 3600 rpm, 1300 psig, 950 F, 1.5 in. Hg abs, 13,800 v, 3 phase, 60 cycle, 5 bleed pts
Exciter, 1 per unit.....General Electric Co
300 kw, drive: 4160 v, 1200-rpm motor, direct-conn amplidynes
Hydrogen coolers.....General Electric Co
House turbines, 2.....General Electric Co
Automatic extraction-induction, 6 stage, 7500 kw, 3600 rpm, 1300 psig, 950 F, 4 in. Hg abs, 4160 v, 3 phase, 60 cycle
House turbine exciters, direct connected.....General Electric Co
Main condensers, 1 per unit.....Foster Wheeler Corp
Single pass, 40,000 sq ft, divided waterbox, al-brass tubes
Steam-jet air pumps, 1 per unit.....Foster Wheeler Corp
Condensate pumps, 2 per unit.....Foster Wheeler Corp
Condensate pump drive.....General Electric Co
125 hp, 440 v, 875 rpm, squirrel cage
Circulating-water pumps.....Foster Wheeler Corp
2 per unit, 40,000 gpm, 31.0-ft head, vertical
Circulating-water pump drive.....General Electric Co
400 hp, 4160 v, 505 rpm
Vacuum pumps, 1 per unit.....Nash Engineering Co
Vacuum-pump drives, 20 hp.....General Electric Co
House turbine condensers.....Foster Wheeler Corp
Single flow, 4000 sq ft, divided waterbox
House unit steam-jet air pump.....Foster Wheeler Corp
House unit condensate pumps, 2 per unit.....Foster Wheeler Corp
2 stage, 170 gpm, 190-ft head
Condensate pump drive, 20-hp motor.....General Electric Co
House unit circulating-water pumps.....Foster Wheeler Corp
2 per condenser, 9000 gpm, 26-ft head
Circulating pump drive, 100-hp motor.....General Electric Co
Traveling water screens.....Link-Belt Co
Chlorinating equipment.....Everson Manufacturing Co
Piping.....Midwest Piping & Supply Co

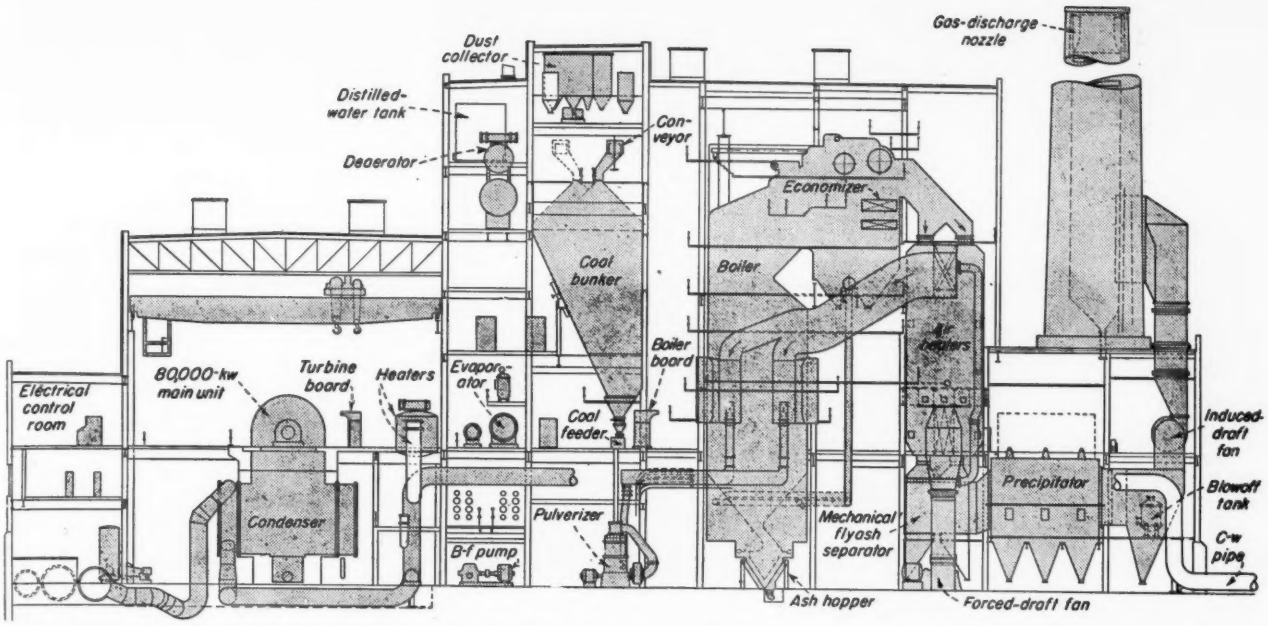
FEEDWATER SYSTEM:

10th-stage feedwater heater.....Foster Wheeler Corp
1 per turbine, 4-pass, 3900 sq ft, 600-psig shell, 900-psig tube
13th-stage feedwater heater.....Foster Wheeler Corp
1 per unit, 4-pass, 3600 sq ft, 400-psig shell, 900-psig tube
16th-stage feedwater heater.....Foster Wheeler Corp
1 per unit, 4-pass, 300-psig shell, 900-psig tube
21st-stage feedwater heater.....Foster Wheeler Corp
1 per unit, 4-pass, 300-psig shell, 225-psig tube
Deaerating heater and vent condenser, 1 per unit.....Elliott Co
Evaporator, 2 per unit.....Foster Wheeler Corp
Evaporator condenser, 1 per unit.....Foster Wheeler Corp
Boiler feed pumps, primary....Worthington Pump & Machinery Corp
Five, 1 spare rotor, 575,000 lb per hr, 1210-ft total head
Boiler feed pumps, secondary....Worthington Pump & Machinery Co
Five, 1 spare rotor, 575,000 lb per hr
Boiler feed pump drives.....General Electric Co
2000 hp, 4160 v, 3585 rpm

MISCELLANEOUS EQUIPMENT:

Miscellaneous pumps.....Worthington Pump & Machinery Corp; Ingersoll-Rand Co; Byron Jackson Co; Nash Engineering Co
Miscellaneous tanks.....Western Pipe and Steel Co; Walter R Cole & Co
Bearing cooling-water heat exchanger, 2....Ross Heater and Mfg Co
Turbine-room crane.....Judson-Pacific-Murphy
Water-screen crane.....Moffett Manufacturing Co
Miscellaneous chain hoists.....Bellamy-Robie; Spencer & Morris
Air compressors, four, 210-cfm.....Ingersoll-Rand Co
Air compressor, one, 250-cfm.....Chicago Pneumatic Tool Co
Insulation (Johns-Manville Corp).....Western Asbestos Co
Lubricating-oil filter pumps.....Sier Bath Gear and Pump Co
Lubricating-oil filters.....Bowser, Inc
Hotwell level indicators.....Republic Flow Meters Co
Remote liquid-level indicator.....Yarnall-Waring Co
Centrifugal fire pump.....Food Machinery Corp
Pressure reducing and desuperheating equipment.....Swartwout Co
Vacuum gages and barometers.....Uehling Instrument Co
Cast iron circulating-water piping.....Axelson Manufacturing Co
Level indicators.....Crosby Steam Gage & Valve Co
Indicating thermometers.....Taylor Instrument Co's; Manning, Maxwell & Moore
Valves.....Edward Valves, Inc; Crane Co; Ohio Injector Co; Wm Powell Co; Chapman Valve Co; Fisher Governor Co; Atwood & Morrill Co; Jenkins Bros; Strong, Carlisle & Hammond Co; Mason-Neilan Regulator Co; Ruggles Klingeman Mfg Co; Manning, Maxwell & Moore; Merco-Nordstrom Valve Co; Parker Appliance Co; Rensselaer Valve Co; Pacific Valve & Pump Co
Temperature, pH and conductivity recorders..Foxboro Co; Leeds & Northrup Co
Temperature, pressure, level controls..Mason-Neilan Regulator Co; Hammel-Dahl Co; Fisher Governor Co; Taylor Instrument Co's
Boiler-gage periscopes.....Yarnall-Waring Co
Indicating pressure gages.....Foxboro Co; Manning, Maxwell & Moore
Sump pumps.....Pacific Pump Works Co
Steam traps, blowoff valves.....Yarnall-Waring Co
Expansion joints.....Zallea Brothers and Johnson
Ventilators.....Airfan Engineering Co
Cast-iron pipe for salt-water lines.....Alhambra Foundry Co
Outdoor transformers, motor control switchgear, instrument transformers.....Allis-Chalmers Manufacturing Co
Salt-water strainers.....Andale Co
Elevator.....Atlas Elevator Co
Metering and control equipment.....Bailey Meter Co
Axial-flow propeller fans.....Buffalo Forge Co
Fire-extinguishing equipment.....C-O-Two Fire Equipment Co
Station-service switchgear, 4160 v.....General Electric Co
Auxiliary relays.....General Electric Co
Circulating-water piping.....Kutztown Foundry and Machine Corp
Oil centrifuge.....The Sharples Corp
Dry-type transformers, high-speed oscillograph, and miscellaneous electric equipment.....Westinghouse Electric Corp
Fuel-oil storage tanks.....Chicago Bridge & Iron Works

ENGINEERS AND CONSTRUCTORS .....
Stone & Webster Engineering Corporation



STATION DESIGN STRICTLY FOLLOWS unit principle: one boiler feeds one turbine through single steam main, returns to boiler through one boiler-feed line. Each unit has its own set of three motor-driven boiler feed pumps, auxiliaries

STATION C

Braddock Light and Power Co plans first two units of new station at Alexandria, Va. on banks of the Potomac. Plant ultimately will have total of five units not interconnected

▶ ON THE BANKS of the Potomac River opposite Washington, D. C. the Braddock Light and Power Co, Inc is erecting a station of the strictly unit type. The first two 80,000-kw units are scheduled to start in the summers of 1949 and 1950, and the plant will ultimately house five units. These units will have no cross connections either at the main steam headers or the single boiler feed lines. Each unit will be served by three motor-driven boiler feed pumps. Design strives for simplicity in station layout with the aim of realizing savings in construction costs and the utmost in operating reliability.

Turbine-Generators. The single-cylinder 80,000-kw rating turbine-generators are expected to develop 93,755 kw at maximum continuous boiler output of 800,000 lb per hr of steam. The turbines operate with 850-psig, 925-F steam at a rotor speed of 1800 rpm. The turbines' five bleed points will feed three closed and two open feedwater heaters and one evaporator.

The turbines drive 80,000-kw 85%-pf generators, constructed for 13,800-v 3-phase 60-cycle service, and direct-connected exciter and pilot exciter. The generators will be hydrogen cooled with the generator casings holding surface-type hydrogen coolers using service water for cooling.

Turbines exhaust into 75,000-sq-ft surface condensers rated at 1.0-in. Hg abs backpressure. The 2-pass condensers will have Admiralty metal tubes and will use fresh water from the Potomac River for cooling. Instead of having steam-jet air ejectors the condenser air evacuation will be performed by two motor-driven rotary air-removal pumps for each unit. Each pump has a capacity of 540 cfm at 1 in. Hg abs pressure.

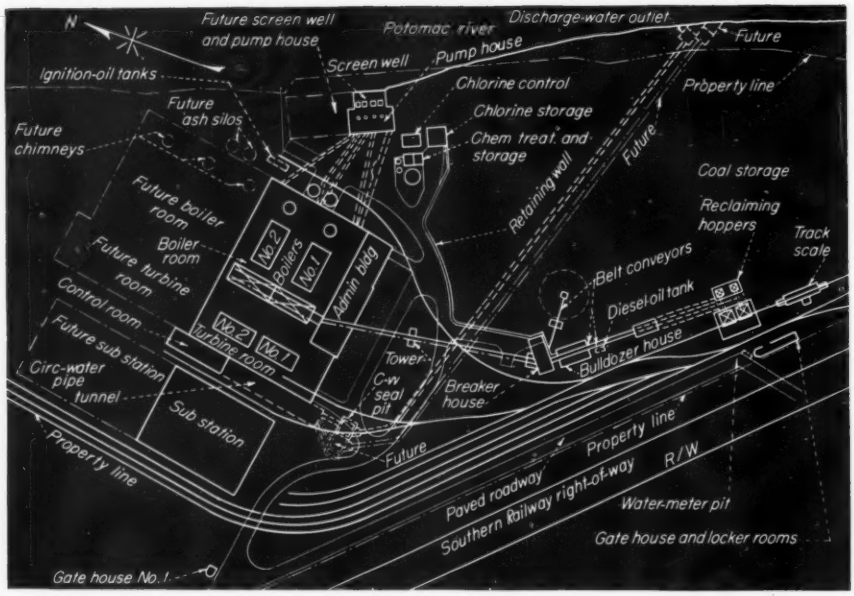
Because of the appreciable gradient from the river bank to the plant and also because of subsoil limitations main-condenser circulating water must be led through steel pipes. Inlet pipes leading to the condensers will be 54 in. dia; discharge lines will be 48 in. dia connecting to a 96-in. pipe running through a tunnel to a seal pit southwest of the plant building. Both the circulating and drainage water will discharge to the river from the seal pit through 84-in. concrete pipes. One complete 84-in. line and 330 ft of a second line will be installed initially.

In the power plant building the circulating-water piping will be run above ground and largely overhead since subsoil conditions will not allow an underground tunnel without requiring concurrent expensive foundation construction.

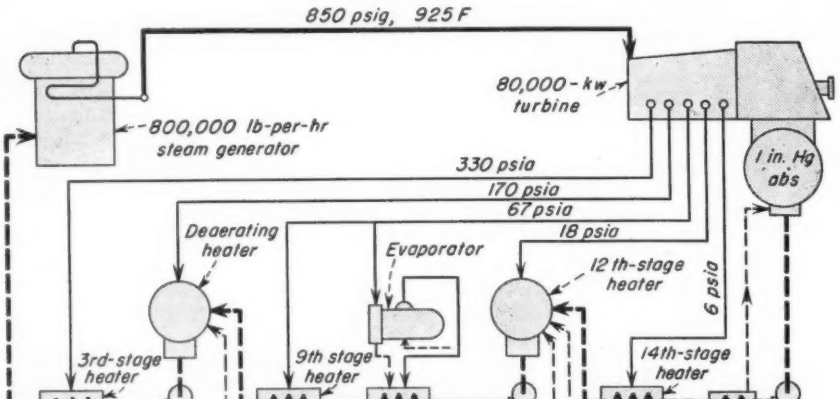
Two circulating pumps of the vertical type with 33,450-gpm capacity against 49-ft total head serve each main condenser. Each pump is driven by a 500-hp 590-rpm 2300-v motor. The pumps will be housed on the river bank. Adjacent to the pump house will be a building for chemical feed and storage, chlorinating control equipment and chlorine storage. This building will also serve an outdoor cold-process clarifier for evaporated makeup water and bearing cooling water. Circulating water will be chlorinated under automatic control at the pump suction.

Steam Generators. The two 800,000-lb-per-hr boilers produce steam at 875 psig and 925 F at the superheater outlet. Each unit has a superheater, waterwalls, 2 tubular air heaters in parallel and an economizer. Superheat control will be effected by a combination of bypass damper setting and tilting burners.

The pulverized-coal fired furnace of each boiler will be fed by four motor-driven pulverizers with integral ex-



EXTENSIVE COAL-STORAGE FACILITIES will be provided on the plant site with special precautions to eliminate dust nuisance that may annoy nearby neighbors



HEAT-BALANCE LAYOUT FEATURES deaerating heater operating at over 150 psia at full capability of main unit. Evaporator has separate evaporator condenser

hausters. Four motor-driven oil pumps serve to ignite the coal in the furnace.

Automatic combustion control will supervise and adjust steam and furnace draft pressure, fuel-air, steamflow fuel-flow, and primary-air- fuel-flow ratios for each of the boilers. Automatic superheat temperature control equipment will also be provided.

The two tubular air heaters arranged in parallel on each boiler will be fitted with dampers so one can be shut down at low loads. The increased velocity will result in better heat transfer.

Two forced-draft and two induced-draft fans, each with individual single-speed motor drive, will serve each steam generator. Forced-draft fans will be direct connected with flow control by inlet vanes. Induced-draft fans will be driven through magnetic couplings. Each boiler has its own radial brick chimney. Each stack exit will be equipped with a venturi throat or nozzle to give the flue gas a leaving velocity slightly under 7000 fpm at full load.

Ash Control. Because of the nearness of residential areas to the plant site special precautions have been taken to reduce flyash leaving the stack to a negligible value. After leaving the air heaters the flue gas enters a mechanical flyash separator from which it flows into a 3-section electrostatic precipitator before entering the induced-draft fan suction. From the air heater inlet to the i-d fan inlet the flue-gas path is divided into four parallel lanes with dampers at the air-heater inlet. This permits shutting down any one lane to clean the precipitator without discharging any flyash to the stack. The unit remains in service during this operation with the other three lanes carrying the gas flow.

The dry-bottom boilers will have refractory-lined ash hoppers below the furnaces. Vacuum dry-type semiautomatic ash-handling equipment includes ash-storage silos, ash moisteners, dischargers, motor-driven exhausters, transport piping, valves and so forth. There are 33 points of automatic control on the ash system, the boiler ash hopper being the only point left to manual control.

Coal Handling. Coal will be delivered on railroad sidings, which will be fitted with a track scale having an automatic weigh beam. Trackage will accommodate about 100 coal cars. A rotary-type car dumper will discharge car contents into a 2-outlet hopper. Individual feeders and two inclined-belt conveyors deliver coal from the hopper into the entrance chute of the Bradford breaker.

For the initial installation, two reclaiming hoppers will be adjacent to the car dumper, each with a feeder delivering to its respective conveyor leading to the Bradford breaker. Feeder design under the car-dumper and reclaiming hoppers contemplates the future installation of a conveyor and stocking-out boom at the south end of the coal-storage area.

Bulldozers will be used for placing coal in the storage area and reclaiming at a later time.

The Bradford breaker discharge hopper will have a short horizontal belt conveyor delivering coal into a distributing hopper equipped with a coal sampler. From here coal feeds to three chutes. One leads to a belt conveyor running to the initial stocking pile. The other two chutes discharge to separate inclined belt conveyors leading to the station. Only one station conveyor will be installed initially.

The inclined conveyor to the station delivers onto a horizontal tripper conveyor extending over the bunkers. Steel coal bunkers with about 1200-ton capacity will be installed in the station, equipped with one automatic coal scale to check pulverizer performance.

Dust-collecting equipment will be installed at all points of coal transfer, in the station, the Bradford breaker struc-

ture and near the car dumper. This will be in line with the policy of eliminating all dust nuisance. These collectors discharge to a central dust collector above the bunkers. From this vacuum system the collected coal dust exhausts to the bunker.

The principal power-plant equipment of Station C is given below.

Acknowledgments. POWER is indebted to the Braddock Light and Power Co for their cooperation, and to H S Frederick of the Stone & Webster Engineering Corp for the basic data that is contained in this article.

PRINCIPAL POWER-PLANT EQUIPMENT

Station C, Units No. 1 and 2, Alexandria, Va.

Braddock Light and Power Co, Inc

STEAM-GENERATING EQUIPMENT:

Boilers, 2.....Combustion Engineering Co
800,000 lb per hr continuous, 875 psig, 925 F, 36,020 sq ft
Superheaters, 2.....Combustion Engineering Co
3 stages, low-temp 12,300 sq ft; int-temp 12,300 sq ft; high-temp 4700 sq ft; bypass control and tilting burners
Economizers, 2 .....Combustion Engineering Co
Continuous finned tube, 17,650 sq ft
Air preheaters, 2.....Combustion Engineering Co
Tubular, 4-pass, 122,500 sq ft
Burners, 16 per boiler.....Combustion Engineering Co
Tilting, pulverized coal, four in each corner
Pulverizers, 4 per boiler.....Combustion Engineering Co
Raymond bowl, 28,400 lb per hr, 100 grindability on Hardgrove scale
Soot blowers.....Diamond Power Specialty Corp
Boiler and superhtr, 12; economizer, 5; air preheater, 6
Forced-draft fans, 2 per boiler.....American Blower Corp
110,000 cfm, 100 F, 11-in. total head, 1200 rpm, inlet-vane control louver-type damper in fan outlet
Induced-draft fans, 2 per boiler.....American Blower Corp
190,000 cfm, 330 F, 15-in. suction, 720 rpm
I-d fan magnetic coupling.....Electric Machinery Mfg Co
Forced-draft fan drive.....Allis-Chalmers Manufacturing Co
250 hp, 1170 rpm, 2300 v, 3-phase, 60 cycle
Induced-draft fan drive.....Allis-Chalmers Manufacturing Co
700 hp, 900 rpm, 2300 v, 60 cycle, 3-phase
Combustion-control system.....Hagan Corp
Feedwater flow and level control..... .....Bailey Meter Co
Superheat control.....Leeds & Northrup Co
Blowoff tank.....Missouri Boiler & Sheet Iron Works
Water-treating equipment.....Infilco Inc
Safety valves.....Consolidated Div, Manning, Maxwell & Moore
Feed and check valves.....Edward Valves, Inc
Blowoff valves .....Yarnall-Waring Co
Water columns and gages..... .....Diamond Power Specialty Corp
Miscellaneous valves.....Hancock Div, Manning, Maxwell & Moore

POWER-GENERATING EQUIPMENT:

Turbine-generators, 2.....General Electric Co
80,000 kw, 850 psig, 925 F, 1 in. Hg abs, 5 bleed points, 1800 rpm, 13,800 v, 3-phase, 60 cycle, 0.85 pf, direct-connected main and pilot exciter
Condensers, 2.....Worthington Pump and Machinery Corp
75,000 sq ft, 2-pass, inner air coolers and hotwell
Circulating pumps.....Worthington Pump and Machinery Corp
2 per condenser, vertical, 33,450 gpm, 49-ft total head
Circulating pump drives.....Allis-Chalmers Manufacturing Co
500 hp, 590 rpm, 2300 v, 60-cycle
Rotary vacuum pump, 2 per condenser.....Kinney Manufacturing Co
540 cfm at 1-in. Hg abs, approx 29 lb per hr water vapor and 16 lb per hr air at 70 F
Vacuum-pump drive..... .....General Electric Co
40 hp, 350 rpm, 440 v, 3-phase, 60-cycle
Circulating-water valves.....Henry Pratt Co, Inc
Chlorinating equipment..... Wallace & Tiernan Products, Inc

FEEDWATER SYSTEM:

Condensate pumps.....Worthington Pump and Machinery Corp
2 per condenser, 1230 gpm, 160-ft total head
Condensate-pump drives.....Westinghouse Electric Corp
75 hp, 2300 v, 3-phase, 60-cycle, squirrel cage, 900 rpm
Condensate booster pumps.. .....Ingersoll-Rand Co
2 per unit, 525-ft head, 1700 gpm, 1750 rpm
Booster-pump drives.....Westinghouse Electric Corp
300 hp, 2330 v, 3-phase, 60-cycle, 1800 rpm
Closed heater, 3rd stage.....Westinghouse Electric Corp
Vertical, 3170 sq ft
Closed heater, 9th stage.....Westinghouse Electric Corp
Vertical, 3000 sq ft
Closed heater, 14th stage.....Westinghouse Electric Corp
Vertical, 3310 sq ft
Drain coolers, 14th stage.....Westinghouse Electric Corp
Vertical, 320 sq ft
Evaporator, 1 per unit..... .....Westinghouse Electric Corp
Horizontal, 850 sq ft
Evaporator deaerating preheater....Worthington Pump and Mach Corp
Evaporator condensers.....Westinghouse Electric Corp
Horizontal, 1060 sq ft
12th-stage nondeaerating heater..Worthington Pump and Mach Corp
710,000 lb per hr, tray type, 16-psia steam press, vent condenser
6th-stage deaerating heater.....Worthington Pump and Mach. Corp
810,000 lb per hr, tray type, 152-psia steam press, 2 vent condensers, 16,275-gal storage tank
Boiler-feed pumps, 3 per unit....Worthington Pump and Mach Corp
1075 gpm, 2475-ft total head, 3570 rpm, constant speed
Boiler-feed pump drives.....General Electric Co
800 hp, 3600 rpm, 2300 v, 60-cycle, squirrel cage
Extraction nonreturn valves..... .....Atwood & Morrill Co

COAL-AND-ASH-HANDLING EQUIPMENT:

R R track scale, 1.....The Howe Scale Co
Rotary railroad car dumper..... .....Link-Belt Co
Coal bunker duplex gates.....Stephens-Adamson Manufacturing Co
Bradford breaker .....Pennsylvania Crusher Co
Automatic coal scale..... .....Stock Engineering Co
Vacuum-cleaning equipment .....Lansing Corp; Billmyre Div, Lamson Corp; Gustave Preston, Agents
Dust-collecting equipment.....Pangborn Corp
Hand-operated windswept dust valves.....The Allen-Sherman-Hoff Co
Ash-handling equipment.....The Allen-Sherman-Hoff Co
Coal spraying equipment.....Johnson-March Corp
Belt-conveyor tripper.....Robins Conveyors Division
Coal-handling equipment.....Stephens-Adamson Manufacturing Co

MISCELLANEOUS EQUIPMENT:

Gage boards .....Hagan Corp
Station piping .....Benjamin F Shaw Co
Circulating-water piping.....New York Central Iron Works
Motor-operated main steam valves,
Chapman Valve & Manufacturing Co
1500-lb weld valves.. .....Manning, Maxwell & Moore
Globe valves .....Manning, Maxwell & Moore
Electric traveling crane..... ..Whiting Corp
Automatic air filters.....American Air Filter Corp
Ventilation fans.....Westinghouse Electric Corp
Freight and passenger elevators..... .....Otis Elevator Co
Sewage ejector pumps.....Chicago Pump & Machine Co
Tanks .....J E Hurley Machine and Boiler Works
Boiler-room air-supply fans...Sturtevant Div, Westinghouse Elec Corp
Hydrostatic test pump.....Worthington Pump and Machinery Co
Miscellaneous pumps..... .....Yeomans Brothers
Air compressors.....Ingersoll-Rand Co
Floor grating.....Hendrick Manufacturing Co
Structural steel and bunkers.....Bethlehem Steel Co
Galvanized substation steel.....American Bridge Co
Channel-type roof slab.....Lastek Products Co
Stair treads and platform plates.....American Abrasive Metals Co
Miscellaneous iron .....Empire City Iron Works
Railings .. ..A F Jorss Iron Works
Corrugated asbestos.....The Ruberoid Co
Steel sash .....The William Bayley Co

ELECTRICAL EQUIPMENT:

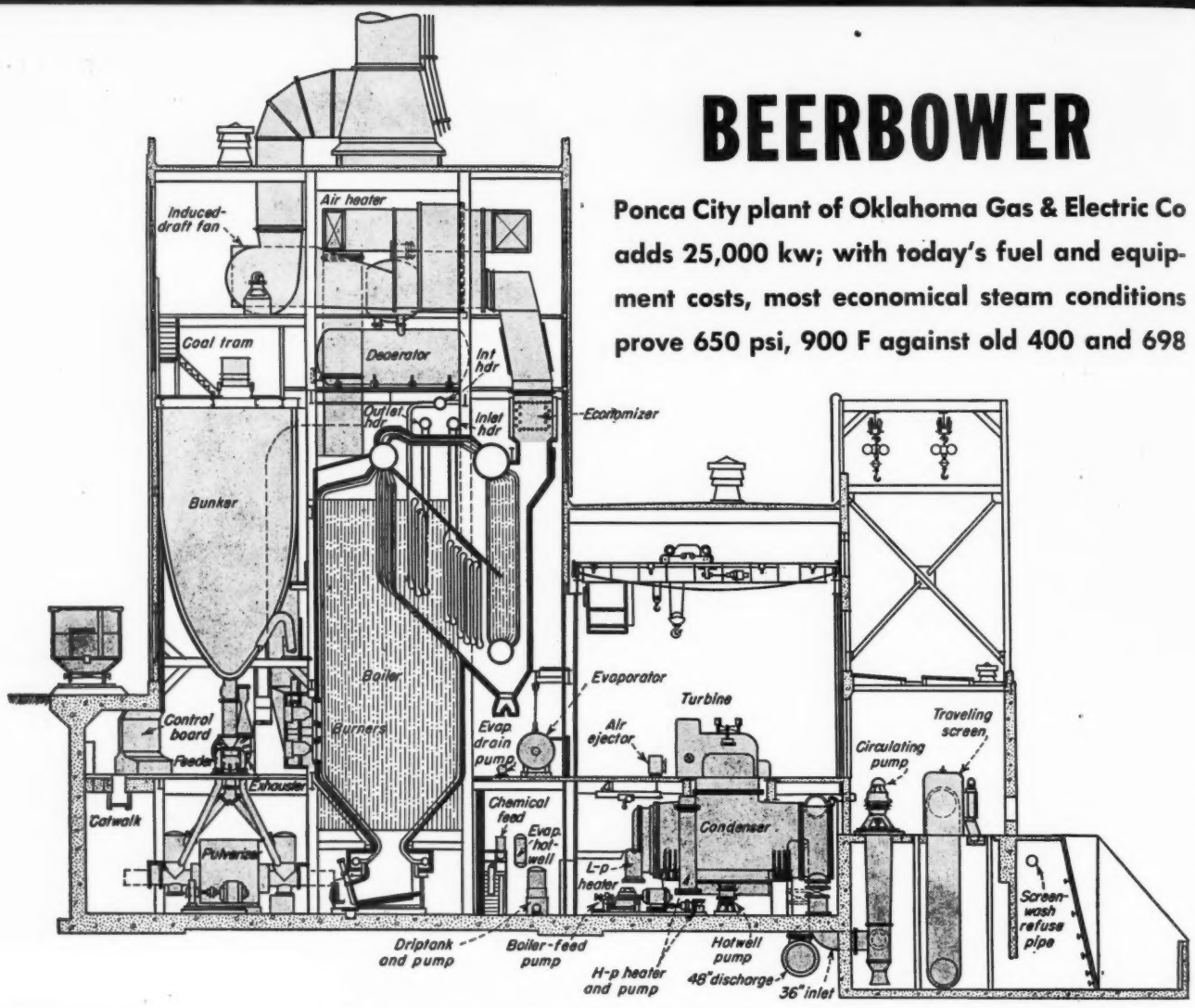
Station-service transformers.....Allis-Chalmers Mfg Co; Moloney Electric Co; Westinghouse Electric Corp
Station-service circuit breakers.....General Electric Co
2300-v station-service switchboard.....I-T-E Circuit Breaker Co
Switchboards.....Westinghouse Electric Corp; Kelek Co
Coalyard unit substation... .....Allis-Chalmers Mfg Co

ENGINEERS AND CONSTRUCTORS

Stone & Webster Engineering Corporation

BEERBOWER

Ponca City plant of Oklahoma Gas & Electric Co adds 25,000 kw; with today's fuel and equipment costs, most economical steam conditions prove 650 psi, 900 F against old 400 and 698



CROSS SECTION shows new 3-drum radiant boiler No. 3 with economizer and regenerative air heater. Forced-draft fan is on same level as induced, behind air heater; 25,000-kw unit No. 2 has condenser across its axis. Note vertical circulator

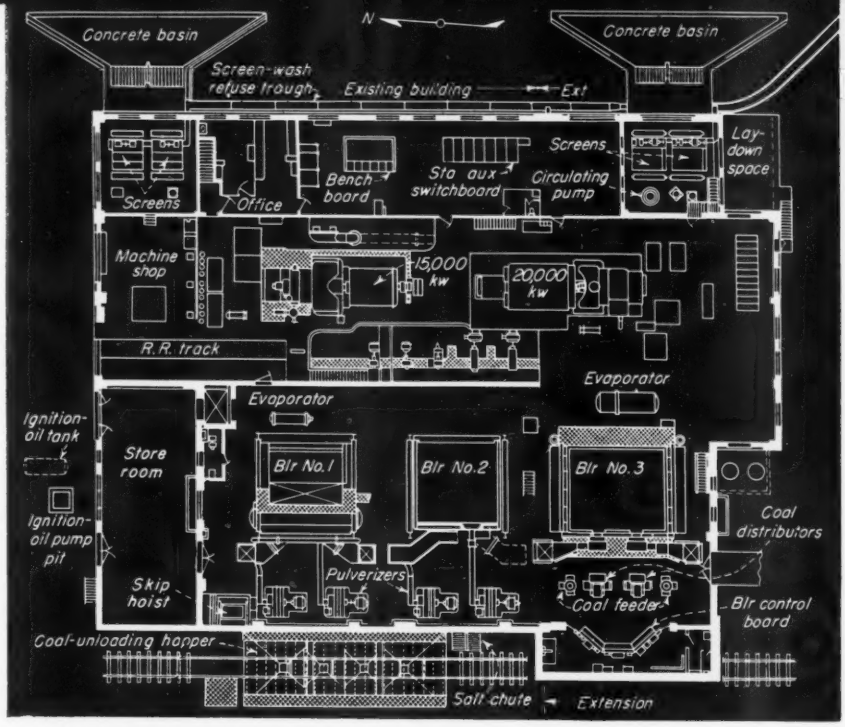
► Located near Ponca City, center of western Oklahoma's petroleum industry, Lincoln Beerbower Station was originally designed to burn petroleum coke from a local refinery, with coal and gas as supplementary fuels. Later, gas became available and petroleum coke was the standby fuel. In the initial installation, made in 1929, two 150,000-lb-per-hr steam generators supplied a 15,000-kw turbine-generator. Provisions were made for handling and firing both solid and gaseous fuels, and the problems of burning fuels of such different characteristics were solved by suitable furnace design. With relatively low-cost fuels, and at the then-existing state of the art, most economical steam conditions for the first unit worked out to be 400 psi and 698 F.

Changed Conditions. Since then, importance of petroleum coke as a fuel for this plant has declined. Costs of coal and gas have risen. Thus, when postwar extension of this plant was studied, higher pressure and temperature were indicated. When extension was authorized, economical balance between fuel and investment costs dictated relatively modest pressure increase, to 650 psi, and going to 900 F.

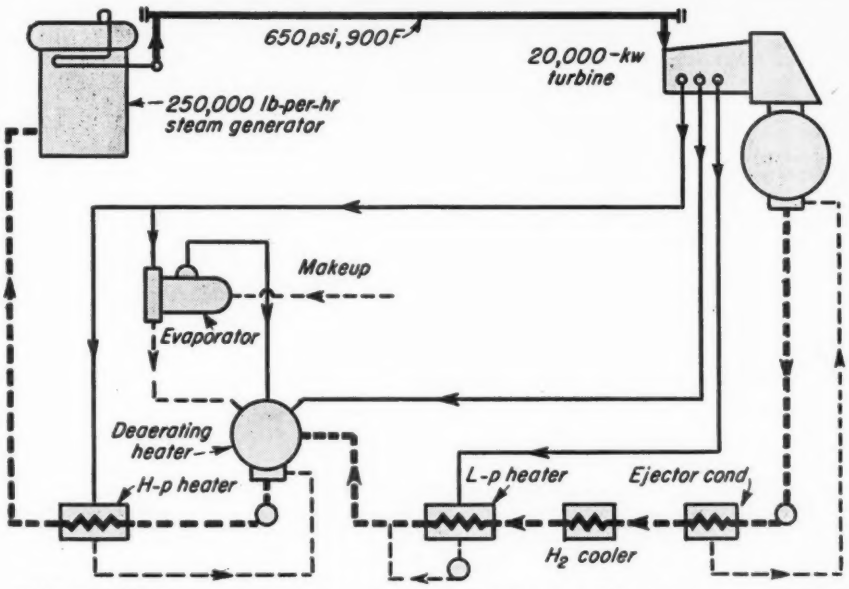
The extension, which goes into operation some time this fall, consists of a single 250,000-lb-per-hr steam generator and a 25,000-kw turbine-generator. The existing building was extended approximately 60 ft. Operated essentially as a unit installation, the new steam generator and turbine make use of water-treatment and fuel-handling facilities installed for the first unit. The section above shows the general arrangement of the new unit, while the plan on the facing page indicates relation of new equipment to old.

Steam Generator. No. 3 steam generator is a 3-drum radiant design, with pendant superheaters having condenser temperature control. Tube bundles in superheater inlet header receive cooling water from the boiler-feed discharge line, ahead of the economizer. Cooling action condenses part of the steam, controlling quality of steam entering the superheater as a means of maintaining desired temperature at the superheater outlet. Because water flow through the tube bundles may, under some conditions, represent a substantial percentage of total feedwater flow, two regulating valves are installed: one in the line to the tube bundles and one in main boiler-feed line just ahead of economizer.

The fully watercooled furnace has a hopper bottom, from which ash is sluiced by a hydraulic system, which also serves the soot hopper. The furnace volume of 17,000 cu ft yields a conservative heat release of 18,850 Btu per cu ft per hr. Two ball-mill pulverizers supply four burners, which also fire natural gas. Draft system consists of single forced- and induced-draft fans above the boiler at the level of the horizontal regenerative air heater. Hydraulic couplings provide volume control with constant-speed-motor drives. Automatic combustion control is air actuated.



ARRANGEMENT PLAN indicates positions of new boiler, turbine and river intake relative to existing equipment. Note new boiler control room for all three units



HEAT BALANCE: New turbine has three bleed points supplying low-pressure closed heater, deaerator and high-pressure heater. Note simplified hookup of evaporator

Control Room. The extension houses a new boiler control room for all three steam generators. Three dust-tight bench panels carry indicators, recorders and controls for each steam generator. On the panel for No. 3, the upper vertical section mounts the various operating meters, the top bench slope ammeters, and the main bench slope selector valves and switches. Relays and other auxiliary devices are under the bench. The full complement of operating instruments includes a steam-temperature recorder and indicator with high-temperature alarms and a boiler-drum-level recorder and controller provided with high- and low-level alarms.

Coal from Oklahoma fields, and the local petroleum coke, come to the plant by rail. Cars discharge into a track hopper. Coal is crushed and raised by skip hoist to a tramway running over the suspended steel bunkers (see section). The tramway was extended for the new unit.

Feedheating Cycle. Turbine-generator No. 2 has three bleed points and the feedwater-heating cycle (see diagram) is relatively simple and straightforward. A vertical hotwell pump discharges condensate through an ejector condenser and generator hydrogen cooler to the low-pressure closed heater, which receives steam from the lowest bleed point —12.8 psia at full load. The middle bleed point—45 psia—supplies the deaerator. The three motor-driven boiler-feed pumps take suction from the deaerator hotwell and discharge through the high-pressure closed heater. The deaerator receives drains from both closed heaters; ejector drains go back to the condenser hotwell. Boiler steam, through a pressure-reducing valve, holds deaerator at 2 psi minimum.

In the simplified evaporator hookup, both drains and evaporation go to the deaerator. Steam supply comes from the top bleed point (154 psia), which also serves the high-pressure heater. Continuous blowdown is automatically controlled by a conductivity cell. Sample water flow goes through a cooling unit, which is thermostatically controlled, and thence to the conductivity cell, which actuates the blowdown valve. Concentration in the evaporator thus regulates rate of blowdown.

Water Treatment. Makeup for the evaporator comes from filters and softeners installed for boilers 1 and 2. Wells and springs supply raw water. For internal treatment in boiler 3, a portable air-motor-driven mixer and dissolving tank discharge into a feed tank supplied with water from the main boiler-feed line ahead of the regulating valve. Sufficient pressure differential is thus available to inject chemical feed into the boiler drum. A complete sampling system is provided for main steam line, superheater inlet header, front and mud drums, condenser hotwell, boiler-feed-suction line and evaporator vapor line. Degassers and conductivity cells are installed for main-steam, evaporator-vapor and boiler-feed-suction samples; a pH cell is also provided for the boiler-feed-suction samples. Cooling-water valves are all thermostatically controlled.

Intake System. Circulating water for the horizontal cross-flow 2-pass condenser comes from the Arkansas River. The new unit has its own intake, a concrete basin having a trash rack. Stop logs precede and follow the traveling screen. Monorail hoists, on steelwork above the building section housing the circulator and screens, serve to lift out equipment for servicing. Roof hatches give access.

The vertical propeller-type circulating pump discharges into a 36-in. condenser-inlet line. Located across the turbine axis, the condenser discharges into a 48-in. line, which is joined by a line from No. 1 condenser. Discharge is downstream from the plant.

Station Facilities. The section and plan show arrangement of new equipment clearly. The plan indicates location of some of the general station facilities included in the original installation, such as the switchgear on the river side of the turbine room, and the storeroom and machine shop on the north side. Building extension includes a concrete-slab laydown space at the northeast corner.

The filters and softeners installed with the original unit are in the basement (not shown) below the pulverizers for steam generators 1 and 2. Basement area under the switchgear shown in the plan on the preceding page contains the power-and-light and battery rooms, and storage space.

Data on this installation were furnished by W C Drummond, E H Schiemann and I H Emms, of Pioneer Service & Engineering Co, with the cooperation of Oklahoma Gas & Electric Co.

PRINCIPAL POWER-PLANT EQUIPMENT

Unit No. 2, Lincoln Beerbower Station, Ponca City, Okla.
Oklahoma Gas and Electric Company

STEAM-GENERATING EQUIPMENT:

Boiler, superheater, economizer.....Foster Wheeler Corp
3-drum, radiant watertube pulverized-coal-and-gas-fired boiler. Continuous output 250,000 lb per hr at 665 psig and 900 F; 275,000 lb per hr for 4 hr. Design pressure 750 psig. Surfaces: blr, 7495 sq ft; suphtr, 10,200 sq ft; economizer, 6048 sq ft.
Air heater, regenerative, 48,000 sq ft.....Air Preheater Corp
Soot blowers.....Diamond Power Specialty Corp
6 rotary and 6 telescopic for boiler; 8 rotary for economizer
Pulverizers, 2.....Foster Wheeler Corp
17000-lb-per-hr ball mills, Westinghouse motor drive
Forced-draft fan.....Buffalo Forge Co
82,000 cfm, 1150 rpm, 200-hp GE motor, hydraulic coupling
Induced-draft fan.....Buffalo Forge Co
160,000 cfm, 865 rpm, 450-hp GE motor, hydraulic coupling
Hydraulic couplings.....American Blower Corp
Combustion control, air actuated.....Bailey Meter Co
Feedwater regulator, 3-element, air-actuated.....Bailey Meter Co
Nonreturn valves, 10-in.....Edward Valves, Inc
Gage glasses, 2, bi-color.....Diamond Power Specialty Corp
Safety valves (Consolidated).....Manning, Maxwell & Moore
Ash-handling system.....Allen-Sherman-Hoff Co
Ash and slag hopper, sluicing nozzles, trench liners, clinker grinder, two ash pumps, bilge pump, piping to yard
Coal flowmeters in coal spouts.....Bailey Meter Co
Coal tramcar track extension.....Beaumont-Birch Co
Boiler-feed pumps, 3.....Worthington Pump & Machy Corp
375 gpm, 891-ft total head, 300-hp Westinghouse motor
Makeup and boiler fill pumps, 2....Worthington Pump & Machy Corp
100 gpm, 247-ft total head, 15-hp Electro-Dynamic motor
Ignition-oil pump, 1.....Worthington Pump & Machy Corp
5.4 gpm, 100-psig discharge pressure, ¾-hp Master Electric motor
Sluicing-water pump, 1.....Ingersoll-Rand Co
1200 gpm, 300-ft total head, vertical, 125-hp GE motor
Chemical mixer, air-driven, portable.....Mixing Equipment Co, Inc

TURBINE-GENERATOR AND AUXILIARIES:

Turbine-generator, 1.....Westinghouse Electric Corp
25,000-kw, 0-8-pf single-cylinder parallel-flow 3600-rpm 650-psi 900-F 1.5-in. Hg turbine; 13,800-v 3-phase 60-cycle hydrogen-cooled (0.5 psig) generator with direct-connected main exciter
Condenser, 1.....Foster Wheeler Corp
18,000-sq-ft, horizontal, cross-flow 2-pass unit with Muntz-metal tube sheets, phosphorized-admiralty tubes
Air ejector, 1.....Foster Wheeler Corp
Twin No. 6, 2-stage primary, 2-stage secondary elements. 191-sq-ft-intercondenser, 64-sq-ft aftercondenser. 400-psi steam
Priming ejector, single-stage, 1500 lb per hr....Foster Wheeler Corp
Circulating-water pump, 1, vertical.....Foster Wheeler Corp
22,900 gpm, 19.9-ft total head, 150-hp Westinghouse motor
Condensate pump, 1, vertical.....Foster Wheeler Corp
475 gpm, 210-ft total head, 50-hp Westinghouse motor
Oil system, continuous purification, storage tank.....Bowser, Inc
Condenser-hotwell level control.....Fisher Governor Co
Low-pressure heater.....Foster Wheeler Corp
998-sq-ft vertical, removable-bundle floating-head multi-pass closed heater with arsenical-copper tubes
High-pressure heater.....Foster Wheeler Corp
789-sq-ft vertical, removable-bundle, floating-head multi-pass closed heater with tubes of 80-20 cupro-nickel
Deaerating heater.....Cochrane Corp
Vertical, direct-contact heater with horizontal storage tank. Capacity: 250,000 lb per hr
Evaporator.....Foster Wheeler Corp
Single-effect, horizontal, 112.5-sq-ft unit with preheater section Capacity: 6000 lb per hr vapor at 42.7 psia
Evaporator-feed pump, 1.....Worthington Pump & Machy Corp
15 gpm, 100-ft total head, 1.5-hp Electro-Dynamic motor
Evaporator drain pump, 1.....Ingersoll-Rand Co
10 gpm, 150-ft total head, 5-hp motor
Service water pumps, 2, vertical.....Ingersoll-Rand Co
1000-gpm, 231-ft total head, 100-hp U. S. Electrical motor
Gland-seal pumps, 2 (one emergency).....Ingersoll-Rand Co
50 gpm, 125-ft total head, 3-hp Westinghouse motor
Low-pressure-heater-drain pump, 1..Worthington Pump & Machy Corp
34 gpm, 323-ft total head, 15-hp Westinghouse motor
High-pressure-heater drain pump, 1.Worthington Pump & Machy Corp
37 gpm, 155-ft total head, 15-hp Electro-Dynamic motor
Sump pump, 1, duplex (two pumps in one basin).Yeomans Brothers Co
125 gpm, 40-ft total head, 3-hp Louis-Allis Co motor
Condensate-return pumps, 2, and one tank.....Ingersoll-Rand Co
15 gpm, 250-ft total head, 7.5-hp Crocker-Wheeler motor
Bleeder check valves, 8-in., 6-in., 4-in.....Atwood & Morrill Co
Butterfly valves; two, 36-in.; one, 18-in.....Henry Pratt Co
Traveling screens, 2.....Chain Belt Co

METERS AND INSTRUMENTS:

Pressure gages, indicating (Ashcroft)....Manning, Maxwell & Moore
Thermometers, indicating.....Weston Electrical Instrument Corp
Thermometer wells.....Moeller Instrument Co
Conductivity recorders.....Leeds & Northrup Co
Miscellaneous recording meters.....Bailey Meter Co
Draft gages.....Bailey Meter Co
Differential controller, travelling screens.....Foxboro Co
Alarms.....Mercoid Corp, Magnetrol, Inc
Group potentiometer-thermometer.....Leeds & Northrup Co
Evaporator-feed flow meter.....Neptune Meter Co
Test flow nozzles.....Builders-Providence, Inc
Ignition-oil-tank level indicator and alarm.....Bell & Gossett Co
Preheater and mill-temperature recorders.....Leeds & Northrup Co

ELECTRICAL EQUIPMENT:

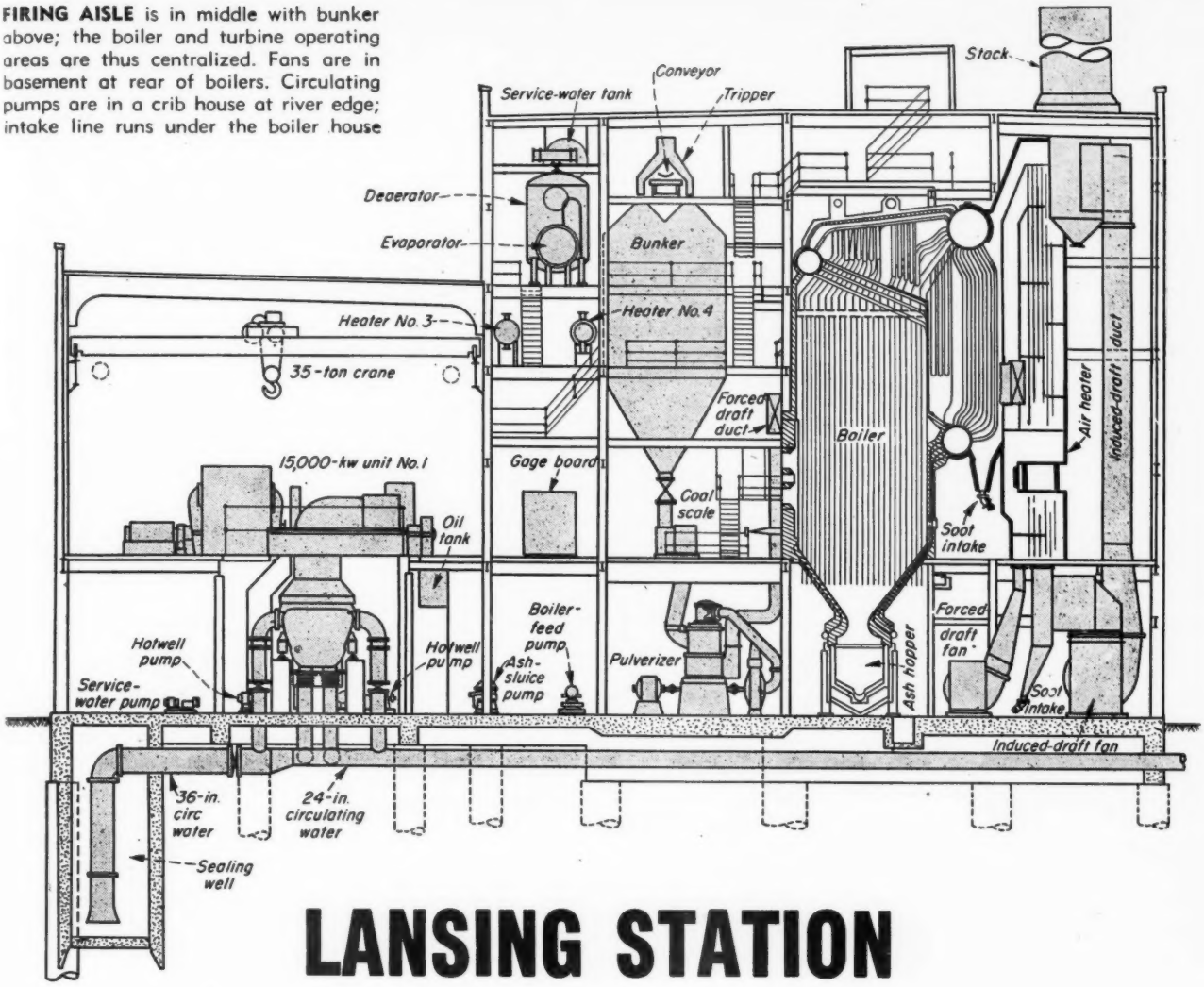
Motors.....General Electric Co; Westinghouse Electric Corp; Crocker-Wheeler Elec Mfg Co; Louis Allis Co; Master Electric Co; U. S. Electrical Motors, Inc; Electro-Dynamic Works, Electric Boat Co
Generator ocb, 23-kv, 2000-amp.....General Electric Co
Transformer ocb, 69-kv, 600-amp.....General Electric Co
Main transformer, 27,500 kva, 14/69 kv.....Westinghouse Elec Corp
Station aux transf, 2500-kva, 14.4/2.4-kv.....Westinghouse Elec Corp
Station aux transf, 200-kva, 2400/240-v..Pennsylvania Transformer Co
Station aux transf, 300 kva, 2400/240-v..Pennsylvania Transformer Co
Disconnect switches, 23 and 69 kv.....Delta-Star Electric Co
Generator neutral grounding transformer.....Wagner Electric Corp
Generator leads, two 1500-MCM cables per phase.....Okonite Co
Sta aux transf leads, one 1250-MCM cable per phase.....Okonite Co
Switchgear, 2300 v.....General Electric Co

MISCELLANEOUS:

Piping and misc valves.....Pittsburgh Piping & Equip Co
Circulating-water-line expansion joints (rubber).....U. S. Rubber Co
Bleeder-line expansion joints (Magnilastic).....Cook Electric Co
Insulation, boiler, piping (expanded vermiculite)....Smith-Totman Co
Service-water strainers.....O C Keckley Co
Steam traps.....Armstrong Machine Works
Station air compressor.....Ingersoll-Rand Co
331 cfm, 100 psig, 75-hp motor
Combustion-control air system..Pennsylvania Pump & Compressor Co
80-cfm 100-psig compressor with aftercooler; 20-hp motor
Combustion-control air filters (absorption).....Dollinger Corp
Combustion-control air filters (stone).....Fisher Governor Co
Damper controls and operators.....Leeds & Northrup Co
Duct work.....Boardman Co
Ventilating fans.....Buffalo Forge Co
Roof ventilators.....Arex Co
Structural steel.....Kansas City Structural Steel Co
Roof tile.....Federal American Cement Tile Co
Floor tile.....Ludowici Celodon
Hollow-metal doors.....Trussbilt, Inc

CONSULTING ENGINEERS.....Pioneer Service & Engineering Co

FIRING AISLE is in middle with bunker above; the boiler and turbine operating areas are thus centralized. Fans are in basement at rear of boilers. Circulating pumps are in a crib house at river edge; intake line runs under the boiler house



LANSING STATION

One 15,000-kw unit of Interstate Power Cc's new station in northeastern Iowa is now operating. Relatively simple design carefully worked out yields efficient performance

▶ ON THE MISSISSIPPI RIVER at the extreme northeastern corner of Iowa, the new Lansing Station feeds into the Interstate Power Co transmission system, supplying a rapidly growing load in cities, towns and rural territory in this area, including diversified industrial demand.

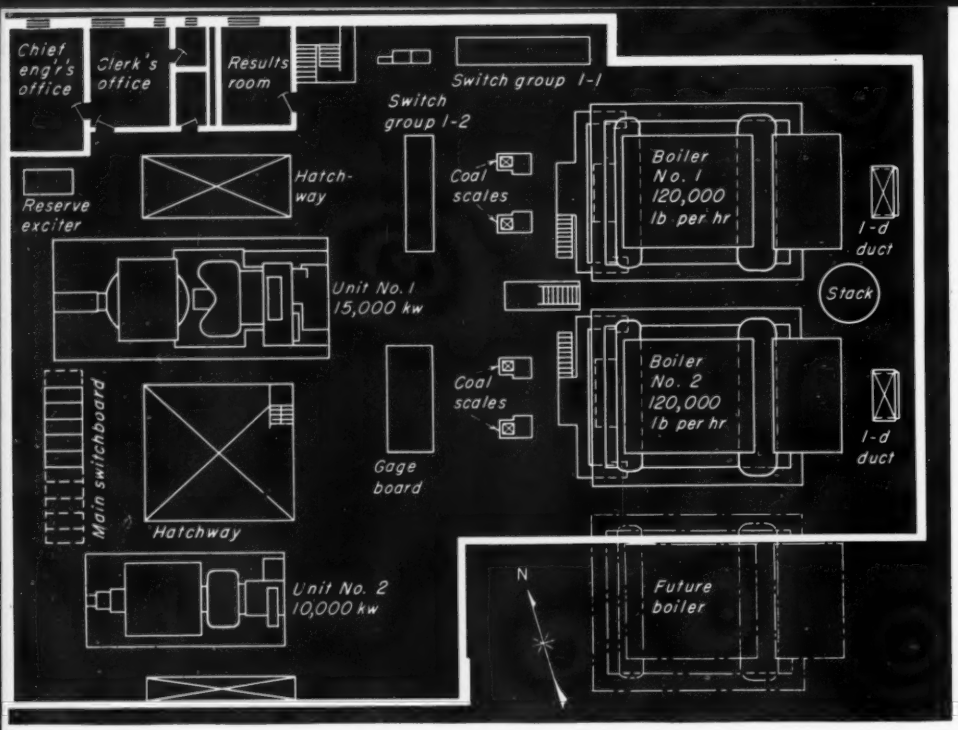
Unit No. 1, a 15,000-kw 850-psi 900-F turbine-generator served by two 120,000-lb-per-hr steam generators, went into operation recently. Unit No. 2, an 11,500-kw machine which had been ordered for another station, was shifted to Lansing for quick delivery and is under way now. It will be fed from existing two boilers until a third (of about 225,000 lb per hr) can be installed (see plan on next page). Further expansion of the plant will take place at the same south end; Unit No. 3 is planned as a single-boiler-turbine installation.

Fuel Handling. Illinois coal comes to the plant by both rail and river barge. Barge coal is unloaded by a crane offshore, which discharges into a hopper feeding a belt conveyor. Railroad cars discharge into a track hopper and another conveyor. Conveyors meet at a junction tower on the north side of the plant, from which a third belt carries coal into the plant, running over steel bunkers above the firing aisle (see section above). Carryall equipment stockpiles coal in outdoor storage and performs the reclaiming operations as well.

As shown in section and plan, station layout provides ample space for convenient operation. With fuel coming in at the north end of the plant, bunkers and firing aisle are in the center, with the boiler room to the east and the turbine room to the west. There is no dividing wall between boiler and turbine areas; the main gage board and operating center is located conveniently with respect to both.

Steam Generators. The two boilers now installed are duplicate 3-drum bent-tube units of 13,385 sq ft, with 20,800-sq-ft tubular air heaters, but no economizers. The single-pass 3-section 4270-sq-ft superheaters have attemperators for steam-temperature control. Soot blowing is handled by steam units, the retractable design being used in the superheater area.

Four horizontal flare-type pulverized-coal burners fire each unit, supplied by two 9700-lb-per-hr Raymond bowl mills. Fully watercooled furnaces have a conservative heat release of 17,400 Btu per cu ft per hr, consistent with the



15,000-KW UNIT NO. 1 is served now by two boilers that will also supply Unit No. 2 until third steam generator is installed. Further extension will be to south

characteristics of coals likely to be burned. Ash goes into a pit under the dry-bottom furnace, and thence to a sluice trench to which connect other points of ash removal. Ash is sluiced to fill at the side of the plant.

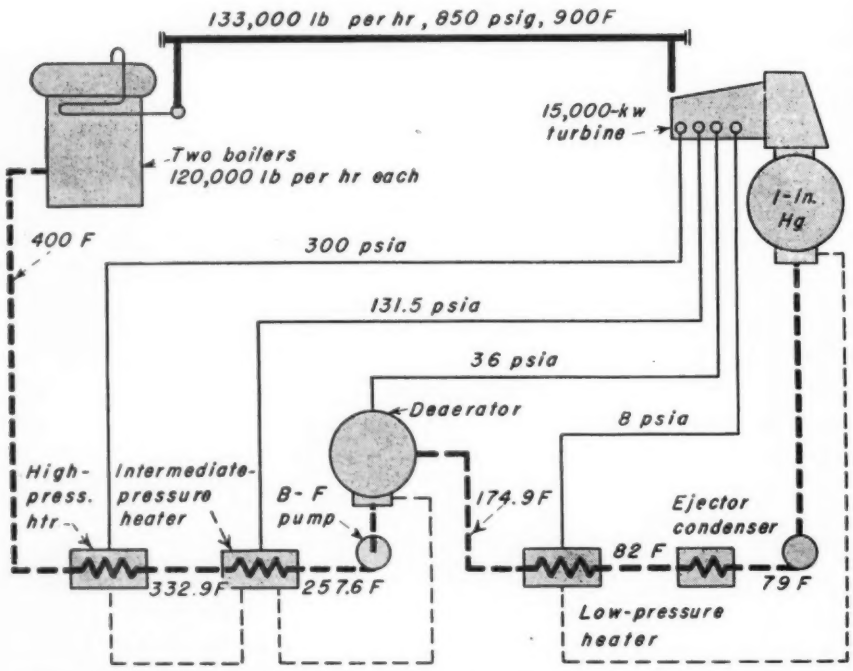
Forced- and induced-draft fans, one each per steam generator, are in the basement to the rear of the boilers and under the air heaters. Constant-speed motors drive the fans; dampers provide volume control on the forced-draft units, and the induced-draft fans are equipped with hydraulic couplings. The automatic combustion-control system is air operated and air regulated.

Turbine Equipment. Unit No. 1 is a single-cylinder 3600-rpm machine with four bleed points, driving an 0.8-pf 13,800-v 3-phase 60-cycle 18,750-kva hydrogen-cooled generator with direct-connected 75-kw 250-v exciter. The diagram below shows the relatively simple feed-heating cycle. Horizontal hotwell pumps discharge through the air-ejector condenser and low-pressure (8-psia) heater to the deaerator, which is supplied from the second bleed point, 36 psia. Boiler-feed pumps (one motor- and one turbine-driven) take suction from the deaerator hotwell and discharge through intermediate and high-pressure heaters, which receive steam from the third (131.5 psia) and the fourth bleed points (300 psia), respectively. An additional motor-driven feed pump will be installed for Unit No. 2. Final feedwater temperature is 400 F. Heaters are all horizontal; low-pressure unit stands alongside the condenser in the basement, intermediate- and high-pressure units are in a center bay above the gage board and below the evaporator and the direct-contact tray-type deaerator.

A horizontal single-effect evaporator receives steam from the third bleed point (131.5 psia), and vapor discharges directly to the deaerator. Raw water for makeup, which comes from deep wells, is softened by hydrogen-zeolite and sodium-zeolite units, with a degasifier, located in the coal-conveyor junction tower to the north of the plant. Phosphate and sulphite for internal treatment are fed to the drums by adjustable-stroke proportioning pumps.

Condenser, Auxiliaries. The 2-pass divided-waterbox condenser, across the turbine axis, is fitted with Admiralty tubes and a twin-element 2-stage steam-jet air ejector, with inter- and after-condenser. A crib house at the river's edge contains the traveling screen and two vertical mixed-flow circulating pumps. These discharge into two 24-in. lines running a little over 250 ft to the plant, and thence under the boiler room to the condenser inlet connections. One of these lines, which expands to 36 in., forms the discharge to a sealing well at the west side of the plant (see section). In normal operation, the inlet line not connected to the discharge handles full intake flow, with discharge to the sealing well through the 36-in. section of the other line. In winter, this normal discharge connection is valved off and return flow is through the 24-in. line back to the crib house for warming.

Plant Performance. In this station, a relatively simple and straightforward design has been carefully worked out to yield economical performance and reliable operation. Unit No. 1 has a full-load over-all heat rate of 12,284 Btu per kwhr, with a boiler efficiency of 84.5%, turbine heat rate of 9,559 Btu per kwhr, and a 98% operating ratio.



FEEDWATER HEATING is carried out, as shown, to final temperature of 400 F. Evaporator, not shown, receives steam from third bleed point; vapor goes to deaerator

PRINCIPAL POWER-PLANT EQUIPMENT

Unit No. 1, Lansing Station, Lansing, Iowa Interstate Power Co

STEAM-GENERATING EQUIPMENT:

Boilers, 2.....Riley Stoker Corp
3-drum pulverized-coal-fired 875-psig 910-F unit rated 120,000 lb per hr. Design pressure 975 psig. Furnace volume 8900 cu ft; heat release 17,400 Btu per cu ft per hr. 3-section single-pass superheater with steam-temperature control. Tubular, vertical air heater. Surfaces: boiler and furnace, 13,385 sq ft; superheater, 4270 sq ft; air heater, 20,800 sq ft

Burners, 4 per boiler.....Riley Stoker Corp
Horizontal, forced-draft flare type, 40,000 lb per hr steam each

Water column, bi-color.....Diamond Power Specialty Corp

Water-level indicator (Eye-Hye).....Reliance Gauge Column Co

Safety valves (Consolidated).....Manning, Maxwell & Moore

Soot blowers.....Diamond Power Specialty Corp

Boiler valves.....Edward Valves, Inc
Stop and check, blowoff, drain, and chemical feed valves

Pulverizers, 2 per boiler.....Combustion Engineering Co
Raymond bowl mills, 117-rpm, rated 9700 lb coal per hr, driven by 125-hp 1180-rpm motors. Rotary feeders, 1-hp 1720-rpm motors

Forced-draft fans, 1 per boiler.....Buffalo Forge Co
38,000 cfm, 8.2 in. sp, 125-hp, 1200-rpm motor, damper control

Induced-draft fans, 1 per boiler.....Buffalo Forge Co
60,000 cfm, 7.5 in. 150-hp 900-rpm motor, hydraulic coupling

Fuel-oil burner pump, 1.....Worthington Pump & Machy Corp
35 gpm No. 3 oil, 275-psi discharge head, 10-hp 1200-rpm motor

Coal scales, 2 per boiler.....Stock Engineering Co
200-lb dump, 8 tons per hr, all-electric, automatic dust-proof, 0.5-hp motor 1125-rpm

Coal gates, 2 per boiler, 20-in. square.....Henry Pratt Co

Ash-handling hydraulic and pneumatic.....United Conveyor Corp
40-tons per hr, ash pipe-sluiced to fill; 1200 gpm water at 125 psig for ash, 900 gpm water at 120 psig for flyash

Ash sluice pump, 1, horizontal, 2-stage.....Ingersoll-Rand Co
1200 gpm, 347-ft net developed head, 150-hp 1800-rpm motor

Combustion-control system.....Republic Flow Meters Co
Air-operated, air-regulated

Combustion-control air supply.....Ingersoll-Rand Co
Single-stage double-acting comp, 86 cfm, 20-hp 1760-rpm motor

Internal water-treatment equipment.....Milton Roy Co
Two 100-gpm tanks. Reciprocating integral-gear adjustable-stroke proportioning pumps, two for phosphate, one for sulphite, 3 gph each. Discharge: 1100 psig (phosphate), 200 psig (sulphite)

Boiler-feed pumps, 1 motor, 1 turbine.....Ingersoll-Rand Co
Horizontal 8-stage 400 gpm, 1050-psig net developed head; 400-hp 3575-rpm motor; 389-hp 3570-rpm 850-psig/15 psig 900-F turbine

Water-softening equipment.....Permutit Co
Capacity 24,000 gal in 12 hr; one hydrogen unit (17,000 gal) one sodium unit (7000 gal). One 35-gpm degasifier with 1/3-hp blower motor. One 3000-gal wooden water-storage tank

COAL-HANDLING EQUIPMENT:

Barge-coal handling crane.....American Hoist & Derrick Co
Slewing speed, 2 rpm; slewing motor, 20-hp 690-rpm; bucket-hoist speed, 230 fpm; capacity, 2700 lb; bucket motor, 75 hp, 875 rpm

Coal-conveying equipment.....Stephens-Adamson Mfg Co
Capacity, 100 ton per hr; 50-ton barge-coal unloading hopper; reciprocating feeder, 3-hp 1800-rpm motor; 24-in. 275-fpm belt conveyor A driven by 10-hp 1800-rpm motor

Track-coal conveyor equipment.....Stephens-Adamson Mfg Co
Vertical, single-track hopper; recip feeder, 5-hp 1800-rpm motor

Track-hopper bilge pump, 1, single-stage.....Yeomans Brothers Co
Vertical, 150 gpm, 35-ft discharge head, 3-hp 1750-rpm motor

Conveyors.....Stephens-Adamson Mfg Co
Conveyor B: 24-in. 275 fpm, 10-hp 1800-rpm motor; Conveyor C: 24-in. 275 fpm, 15-hr 1800-rpm motor. Self-propelled auto tripper

Coal-handling tractor.....Caterpillar Tractor Co
D-7 tractor, 74-in. gage, 22-in. grouser tracks, equipped with No. 25 heavy-duty rear double-drum cable-control unit

Carryall scraper, No. 70, Model LS.....R G LeTourneau, Inc
Capacity: 8.7 yd struck, 11 yd heaped. 18.00x24 rubber tires in front, 21.00x24 rear

TURBINE-GENERATOR AND AUXILIARIES:

Turbine-generator, 1.....Allis-Chalmers Mfg Co
Single-cylinder 15,000-kw 0.8-pf 3600-rpm 850-psig 900-F turbine with 4 bleed points; 18,750-kva 13,800-v 3-phase 60-cycle hydrogen-cooled generator; direct-connected 75-kw 250-v exciter; 3800-sq-ft hydrogen cooler; 15-hp turning-gear motor; two 162-gpm oil coolers; 1200-gal oil reservoir; 180-gpm main oil pump; two horizontal single-stage 600-gpm 30-ftldischarge-head hydrogen-cooler pumps

High-pressure heater.....Griscom-Russell Co
Horizontal 4-pass floating-head 497-sq-ft 285-psia closed heater rated at 134,000 lb per hr. 3/4-in. OD copper-nickel tubes

Intermediate-pressure heater.....Griscom-Russell Co
Horizontal 4-pass U-tube with integral drain subcooler, 750-sq-ft 126-psia closed heater rated 134,000 lb per hr. Cu-Ni tubes

Low-pressure heater.....Griscom-Russell Co
Horizontal 6-pass floating-head with integral drain subcooler, 787-sq-ft 7.5-psia, rated 106,000 lb per hr. Admiralty tubes

Deaerating heater, 1.....Elliott Co
Direct-contact tray-type with vertical water-storage shell and vent condenser. Capacity: 180,000 lb per hr, 1800-gal storage. 701 sq ft tray surface. Single-pass 138-sq-ft vent condenser with arsenical copper tubes. Heater operates at 42.7 psia

Evaporator, 1, horizontal, single-effect.....Foster Wheeler Corp
195 sq ft effective coil surface, 31.9 sq ft disengaging area, copper-nickel coil, rated 8000 lb per hr at 43 psia

Evaporator-feed pumps, 2, single-stage.....Ingersoll-Rand Co
Horizontal, 50-gpm 175-ft discharge head, 5-hp 3500-rpm motor

Condenser, 1, horizontal, 2-pass.....Ingersoll-Rand Co
15,000 sq ft, 150,000 lb steam per hr, Admiralty tubes

Hotwell pumps, 2, horizontal, 2-stage.....Ingersoll-Rand Co
300 gpm, 275-ft discharge head, 40-hp 1750-rpm motor

Circulating pumps, 2, vertical, mixed-flow.....Ingersoll-Rand Co
Single-stage, 11,000 gpm each, 28-ft head, 100-hp 875-rpm motor

Air ejector, 1, steam jet.....Ingersoll-Rand Co
Twin-element 2-stage, with inter- and after-coolers

Condensate drain pump, 1, single-stage.....Ingersoll-Rand Co
Horizontal, 50 gpm, 150-ft discharge head, 5-hp, 3500-rpm motor

Turbine-oil purifier.....DeLaval Separator Co
Capacity 100 gph; displacement discharge pump; 1/2-hp motor

Turbine-room crane, 1.....Manning, Maxwell & Moore
35-ton; 0.6 fpm main-hoist speed with 25-hp 1200-rpm slipring motor; bridge and trolley hand-operated

Traveling screen.....Chain Belt Co
23,400-gpm capacity, 10/2.5 fpm, 3-hp 1150-rpm motor

Screen-wash pump, 1, horiz, single-stage.....Ingersoll-Rand Co
350-gpm 241-ft discharge head, 30-hp, 3550-rpm motor

Service-water pumps, 2, horiz, single-stage.....Ingersoll-Rand Co
200 gpm, 231-ft discharge head, 20-hp 3480-rpm motors

Deepwell pumps, 2, vertical, steel-cased wells.....Layne-Western Co
8-stage, 50 gpm 130-ft discharge head, 5-hp 1750-rpm motors

METERS AND INSTRUMENTS:

Indicating-pressure gages.....Manning, Maxwell & Moore

Flowmeters, draft gages.....Republic Flow Meters Co

Indicating thermometers.....Precision Thermometer & Instrument Co

Barometer, mercury column, test wells.....Precision T & I Co

Attemperator control.....Bailey Meter Co

Potentiometer-temperature recorder.....Leeds & Northrup Co

Portable conductivity meter.....Leeds & Northrup Co

Tank-level indicator.....Republic Flow Meters Co

Condensate venturi tube.....Simplex Valve & Meter Co

Disk meter.....J W Murphy Co

Gage boards.....Republic Flow Meters Co

Laboratory equipment.....E H Sheldon & Co

PIPING, VALVES AND MISCELLANEOUS:

Circulating-water valves, motor-operated.....Crane Co

Circulating-water valves, butterfly.....Henry Pratt Co

Bleeder check valves.....Atwood & Morrill Co

High-pressure globe valves.....Edward Valves, Inc

Float-control valves.....Fisher Governor Co

Steam traps.....Armstrong Machine Works

Expansion joints, rubber.....U. S. Rubber Co

Feedwater-regulating valve (Copes).....J W Murphy Co

Water strainers.....Henry Pratt Co

Steel tanks.....Alpha Tank & Sheet Metal Co
One, 8000-gal, distilled-water storage; one, 2200-gal, service-water storage; one, 500-gal, miscellaneous drains; one, 15,000-gal. fuel oil; one, 10,000-gal, acid storage

Chlorination equipment.....Wallace & Tiernan Products, Inc
Intermittent, de-sliming, 20,000-gpm capacity

Station air compressor, 1.....Ingersoll-Rand Co
Horizontal single-stage, constant-speed control, 304 cfm free air, 100-psig discharge pressure, 60-hp 1175-rpm motor

Flues and ducts.....Connery Construction Co

Insulation.....Sprinkman Sons Corp

ELECTRICAL EQUIPMENT:

Auxiliary power unit substation.....Westinghouse Electric Corp
1500-kva, 13,200/480-v 3-phase air-insulated dry transformer, metal-clad 600-v switchgear

Main control board, 5-section duplex.....Westinghouse Electric Corp

Reserve exciter, motor-driven.....Allis-Chalmers Mfg Co
100-kw 250-v dc gen; 150-hp 440-v 3-ph 60-cycle ind motor

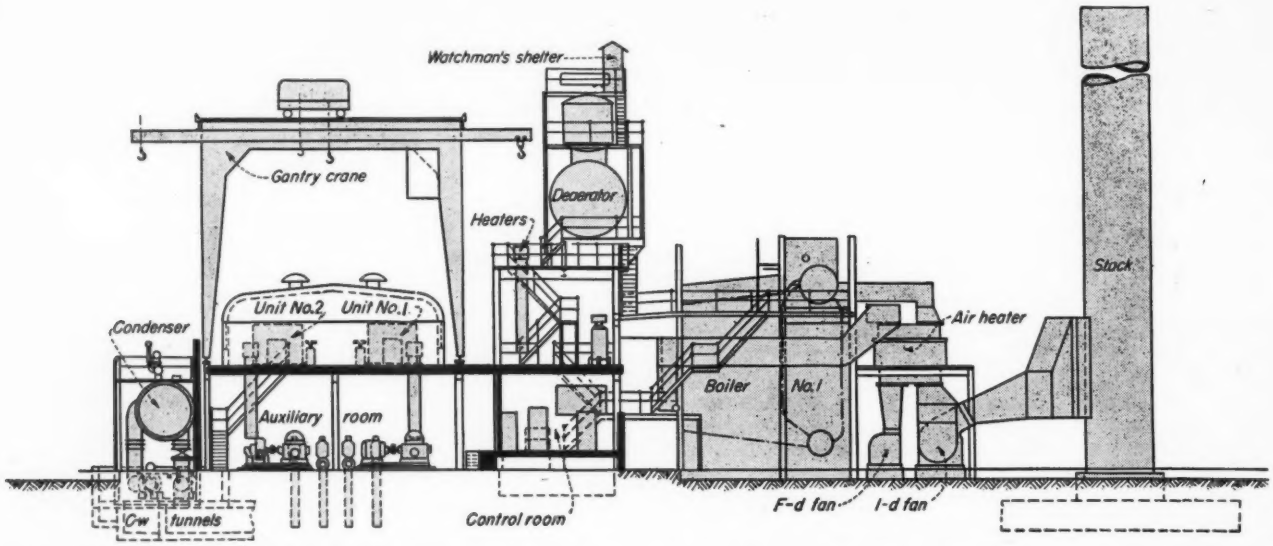
Field-breaker cubicle.....Westinghouse Electric Corp
Two 600-amp 250-v dc air circuit breakers

Battery and lighting panels.....Westinghouse Electric Corp
Two steel cubicles housing molded-case air circuit breakers

Lighting transformers, 2, 75 kva, dry....Westinghouse Electric Corp

Cable and wire.....Simplex Wire and Cable Co

CONSULTING ENGINEERS.....Sargent & Lundy



OUTDOOR STATION HAS THREE ENCLOSED AREAS, turbine-generator units, auxiliary room and control room; all other apparatus outdoors has suitable weatherproof casing. Absence of architectural treatment makes plant appear very different

PERMIAN BASIN

Texas Electric Service Co installs outdoor station near Monahans, Texas. Cooling towers serve condensers of four units. Two units forming heat balance group have one common deaerating heater

► THE WESTERN DIVISION of Texas Electric Service Co serves a portion of the rich Texas oil and gas fields. Their extensive development during and since World War II has created a demand for additional electric power, and predictions indicate a substantial increase in the future. Average load factor in this area reaches 65% annually and the monthly maximum is 74%. To meet rising power demand Texas Electric Service is adding new capacity, representing an increase in system capability of over 170,000 kw, at (1) Handley, near Fort Worth (2) Permian Basin (3) Wichita Falls.

Permian Basin will be rated at 50,000 kw when completed in 1949. Two 12,500-kw turbine-generators and two boilers have just been installed, with two more similar units scheduled for next year.

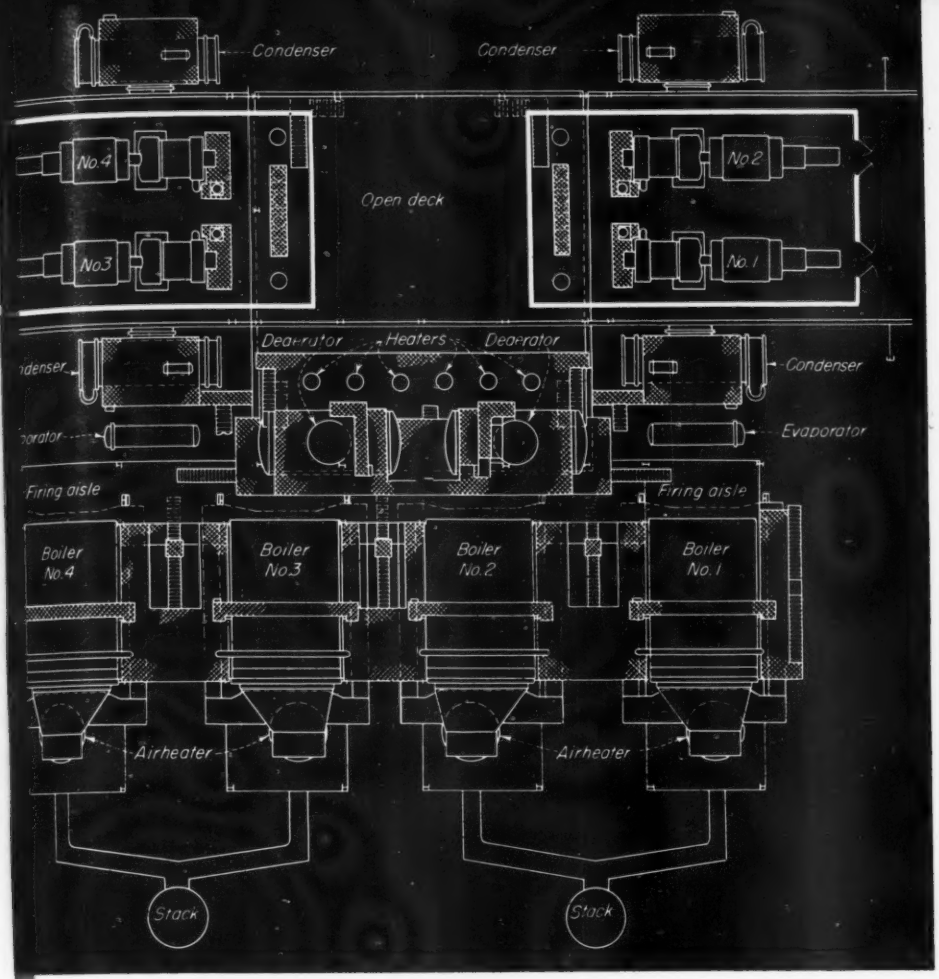
The plant stands in a sparsely settled region of the plains country near Monahans in west Texas on the Texas & Pacific RR. A full section of land was purchased, partly to have adequate area for spacing wells that supply makeup water. Considering the station as a "kilowatt-hour factory" no architectural embellishments are necessary. Company engineers and executives have taken the broad view in accepting advanced practice in outdoor design. Climate generally favors outdoor construction, rainfall averaging only about 15 in. annually. Design precautions guard against effects of moisture and low temperatures. With enclosures provided only for control room, auxiliary room and turbine-generators, large station-construction savings are realized, the main objective in outdoor designs.

Providing a water supply for cooling-tower and general plant makeup poses a real problem in west Texas. Water at Permian Basin comes from a considerable number of wells drilled at widely spaced intervals to minimize the effect of one well on others. Cooling towers provide the only means of meeting circulating-water needs in this location.

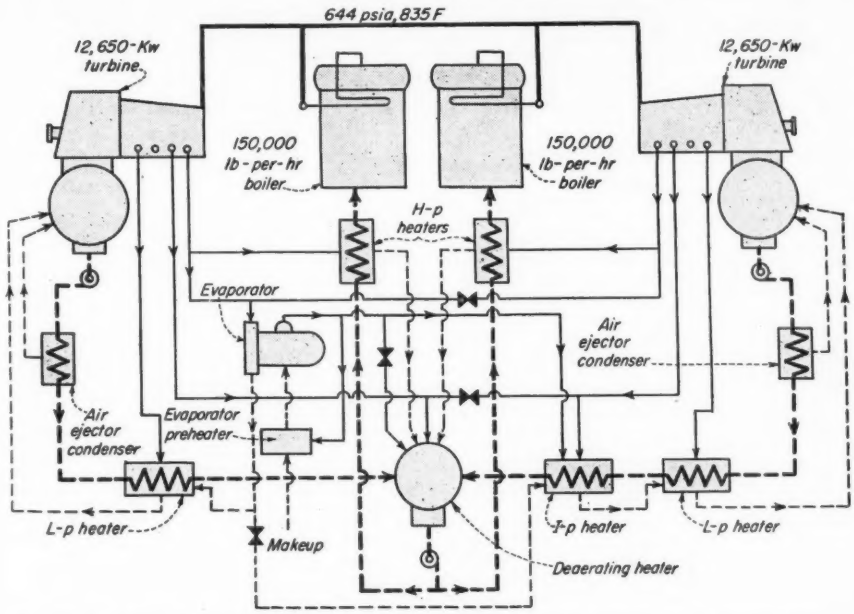
The two present and two future steam generators are of outdoor design, the boilers being completely enclosed by an insulated steel casing with removable-panel side walls and roof and welded-casing rear wall. Each unit delivers rated output of 150,000-lb-per-hr steam at 650 psig and 835 F. Full-load heat release equals 33,000 Btu per hr per cu ft, or 132,500 Btu per hr per sq ft of projected watercooling surface. Natural-gas fuel permits this relatively high unit heat release in the four boiler furnaces.

Natural gas provides the chief fuel with oil as standby. Both are available in the vicinity. Each boiler has four combination gas-and-oil burners in two rows. Oil burners are wide-range mechanical type. A 55,000-bbl storage tank and 2000-bbl day tank hold the oil supply. A Ljungstrom air heater with vertical shaft forms part of each steam-generating unit. Constant-speed motor-driven forced-draft and induced-draft fans, one for each boiler, are mounted on outdoor concrete pedestals between boiler and stack. Each f-d fan, driven by a 150-hp motor, delivers 55,500 cfm. An i-d fan, driven by a 250-hp motor, handles 90,500 cfm. The brick-lined steel stacks, 10 ft 8 in. inside dia, stand 150 ft above grade. One stack serves two boilers.

A somewhat unusual system of steam and water connection serves these four relatively small units. Boilers 1 and 2 feed steam to a header supplying turbines 1 and 2. A single deaerating heater and intermediate-pressure closed feedwater heater, fed by 8th-stage extraction steam, are provided for each pair of turbines to avoid unbalancing steam extracted from two units. Each boiler pair has one common motor-driven boiler-feed pump with a turbine-driven feed pump for standby service for the first pair and a motor-driven standby pump for the second pair.



MAIN CONDENSERS STAND OUTDOORS to one side of turbines, reducing turbine-pedestal height. Heaters and deaerators are located outdoors above control room



HEAT BALANCE ARRANGES TWO TURBINES and two boilers as a group having only one deaerator, one evaporator, one intermediate-pressure heater for two units

The automatic combustion-control system, consisting of master controller, furnace-draft regulator, steamflow-airflow ratio regulator, operates the boilers in accordance with steam load without assistance from the operators. Each control mechanism may be operated manually without disturbing any automatic linkage or other connections. In case of boiler-fan power-supply failure, solenoid-operated shutoff valves cut fuel supply to the boilers.

The 3-element feedwater control system responds to (1) water level in boiler drum (2) steam flow leaving boiler (3) feedwater flow into boiler. The piston-actuated control valves have valve position indicators. An integrally mounted regulator operates each control valve, being loaded from the elements measured. Manual adjustments are provided.

Turbine-Generators. The impulse-type turbine with three bleed points has a rating of 11,500/12,650 kw with throttle steam at 600 psig, 825 F. Rather than the standard 13,529-kva machine, an oversized generator rated 15,625 kva was specified. This operates at 13,200 v, 3-phase, 60 cycles. The air-cooled generator uses a fin-type cooler.

Steel and concrete enclosures protect the turbines on an open deck. Turbine units 1 and 2 are in one enclosure, 3 and 4 in another. A 25-ton gantry crane runs overhead, for general use in handling the turbine and other machinery parts. Sliding steel hatches in the turbine-enclosure roof permit access for maintenance.

Condensers are of 2-pass non-divided waterbox construction with $\frac{7}{8}$-in. tubes, 20 ft long. The 11,000-sq-ft condensers are rated 106 million Btu per hr each when provided with 29.8 cfs cooling water at 80 F. Condensers are not directly under the turbine exhaust, but well to one side, and connected by an elbow. This arrangement permits reducing height of pedestal above base slab; this reduces construction costs.

Two cooling towers, capable of handling about 65 cfs each, cool the condensing water. Six 184-in. 3-blade adjustable-pitch axial-flow fans serve six 2-cell cooling towers. Each fan delivers 375,000 cfm. Guaranteed approach to a 74-F wet bulb is 14 F. Cooling water flows b yravity from cooling tower through concrete tunnels, provided with screens at the entrance, to the circulating-pump suctions adjacent to the condensers. One 13,350-gpm circulator serves each condenser. Makeup water from the wells passes through settling basins and various coolers before going to cooling-tower basin.

An air-to-air heat pump air-conditions the control room because of dust and high temperatures. The pump, with a 10-hp compressor, handles a heat gain of 106,000 Btu per hr and a heat loss of 165,000 Btu per hr with two changes of air per hr from a volume of 14,000 cu ft. Unit coefficient of performance equals 3.5. The unit is not

guaranteed to deliver rated output with outside-air temperature below 30 F, so it will be necessary to install supplementary gas unit heaters.

Each generator connects through a "unit-system" arrangement, consisting of a 14,000-kva 67,200/12,470-v 3-phase oil-insulated self-cooled transformer and 600-amp 69-kv oil circuit breakers of 1,000,000-kva interrupting capacity, to a 66-kv station bus. To serve auxiliary equipment a 1500-kva 3-phase 13,200/480-v askarel-insulated self-cooled unit transformer is throat-connected to air-blast circuit-breaker switchgear. Auxiliary 440-v power distributes through the load center to motorized units. A transformer similar to the auxiliary draws from the utility's 12.5-kv distribution system by means of a disconnect switch for start-up and standby of all four units. The buses are designed to carry 2000 amp continuously.

Permian Basin design aims at the lowest practicable investment cost consistent with efficient and reliable operation. Another objective has been to arrange structures and equipment so minimum operating and maintenance labor will be needed. This is promoted by design compactness and care in both general and detailed arrangement.

Ebasco Services Incorporated has rendered engineering and construction services to Texas Electric Service Co on this Permian Basin project and a similar double-unit turbine-generator and boiler installation at its Wichita Falls Station. Ebasco is designing and contracting four installations of same units for other utility-company clients.

PRINCIPAL POWER-PLANT EQUIPMENT

Permian Basin, Texas Electric Service Co

Units No. 1, 2, 3 and 4

STEAM GENERATING EQUIPMENT:

Boilers, superheaters, 4.....Combustion Engineering Co
Two-drum bent-tube VU, 150,000-lb-per-hr steam at 650 psig, 835 F; 10,887 sq ft heating surface in boiler, 1160-sq-ft waterwalls, 3210-sq-ft superheater, 6100-cu-ft furnace volume, 33,100 Btu per hr per cu ft heat release or 132,500 Btu per hr per sq ft projected waterwall surface
Air heaters, 4.....Combustion Engineering Co
Ljungstrom type, 20,300 sq ft
Burners, 4 per boiler.....Forney Engineering Co
Combination gas and oil
Forced-draft fans, 1 per boiler.....American Blower Co
Motor driven, 55,000 cfm
Induced-draft fans, 1 per boiler.....American Blower Co
Motor driven, 90,500 cfm
Chimneys, 2 ..... Mosher Steel Co
Steel with brick lining, 10-ft 8-in. ID, 150 ft high ..... Wyatt Metal and Boiler Works
Automatic combustion control.....Republic Flow Meters Co
Air compressor .....Ingersoll-Rand Co
Fuel-oil burner pumps.....Worthington Pump & Machinery Co
Fuel-oil heater.....Graham Manufacturing Co
Fuel-oil strainers .....Elliott Co

POWER-GENERATING EQUIPMENT:

Turbine-generators, 4 .....Elliott Co
11,500/12,650-kw 3600-rpm, condensing-regenerative turbine, 600 psig, 825 F, 15,625 kva, 0.8 pf, 13,200 v, 60 cycles, 3 phase, air cooled
Generator air coolers.....Schutte-Koerting Co
Lubricating-oil coolers.....Bell & Gossett Co
Generator oil circuit breakers, 4.....General Electric Co
69-kv 600-amp 1,000,000-kva rating at 13.2 kv
Turbine gantry crane, 25-ton.....Colby Steel & Engineering Co

FEEDWATER SYSTEM:

Water-treating equipment .....Permutit Co
Feedwater control .....Republic Flow Meters Co
Feedwater heaters .....Lummus Co
Low-press, one for each unit; intermediate-press, one for unit No. 2 and one for unit No. 4; high-press, one for each unit
Deaerating heaters, 2.....Elliott Co
Tray type, 300,000 lb per hr, one for two units
Evaporators, 2 .....Griscom-Russell Co
Horizontal, 7500 lb per hr output
Evaporator preheaters, 2.....Elliott Co
Evaporator feed pumps, 2.....Ingersoll-Rand Co
Boiler feed pumps and accessories, 4.....Ingersoll-Rand Co
Boiler feed pump turbine, 1....Worthington Pump & Machinery Corp
Condensers, 4 .....Elliott Co
11,000 sq ft, 2-pass, nondivided water box
Condensate pumps, vertical, 2 per unit.....Ingersoll-Rand Co
Circulating water pump, 1 per unit.....Ingersoll-Rand Co
Horizontal, volute, single stage, 29.8 cfs
Condensate-transfer pumps, 2..... Turbine Equipment Co
Cooling towers, induced draft, 2.....Marley Co
61.9 cfs each, 14-F wet bulb approach, six 50-hp fans each

VALVES, PIPING AND JOINTS:

Boiler nonreturn valves.....Golden Anderson Valve Specialty Co
Safety and relief valves..... Crosby Steam Gage & Valve Co; Manning, Maxwell Moore
Float-control valves.....Kieley & Mueller, Inc
Reverse-current valves.....Atwood & Morrill Co
Power-control valves.....Manning, Maxwell & Moore, Inc
Pressure-reducing valves.....Fisher Governor Co
Altitude valves.....Golden Anderson Valve Specialty Co
Fabricated piping.....Benjamin F Shaw Co
Rubber expansion joints.....U. S. Rubber Co
Metal expansion joints.....Zallea Brothers & Johnson

METERS, INDICATORS & REGULATORS:

Pressure gages.....Crosby Steam Gage & Valve Co
Indicating thermometers.....Manning, Maxwell & Moore, Inc
Boiler meters.....Bailey Meter Co
Recording instruments.....Leeds & Northrup Co
High-water alarm switches.....Mercoid Corp
Temperature regulators, oil heaters.....Spence Engineering Co, Inc
Barometer and vacuum gages.....Manning, Maxwell & Moore, Inc
Sight-flow indicators .....Schutte-Koerting Co

ELECTRICAL EQUIPMENT:

Main transformers, 4.....Pennsylvania Transformer Co
14,000 kva, 67,200/12,470 v, 3 phase, askarel insulated, selfcooled
Auxiliary transformers, 5.....Wagner Electric Co
1500 kva, 13,200/480 v, 3 phase, oil insulated, selfcooled
Lighting transformers .....General Electric Co
Switchboards .....Gavan Graham
Forced-draft-fan motors .....Elliott Co
150 hp, 440 v, 1800 rpm, squirrel cage
Induced-draft-fan motors, 250 hp, 440 v, 900 rpm.....Elliott Co
Boiler feed pump motors, 3, 500 hp, 440 v, 3600 rpm.....Elliott Co
Circulating pump motors, 4..... Elliott Co
250 hp, 690 rpm, 440 v
Vertical condensate pump motors, 8.....U. S. Motors Corp
Motors, miscellaneous.....Westinghouse Electric Corp
Surge protection equipment.....General Electric Co
Battery .....Electric Storage Battery Co
Cable, power, control and lighting.....Anaconda Wire & Cable Corp
Zinc-covered ground cable.....General Cable Co
Iron conduit .....General Electric Co
Fibre conduit.....Westinghouse Electric Corp

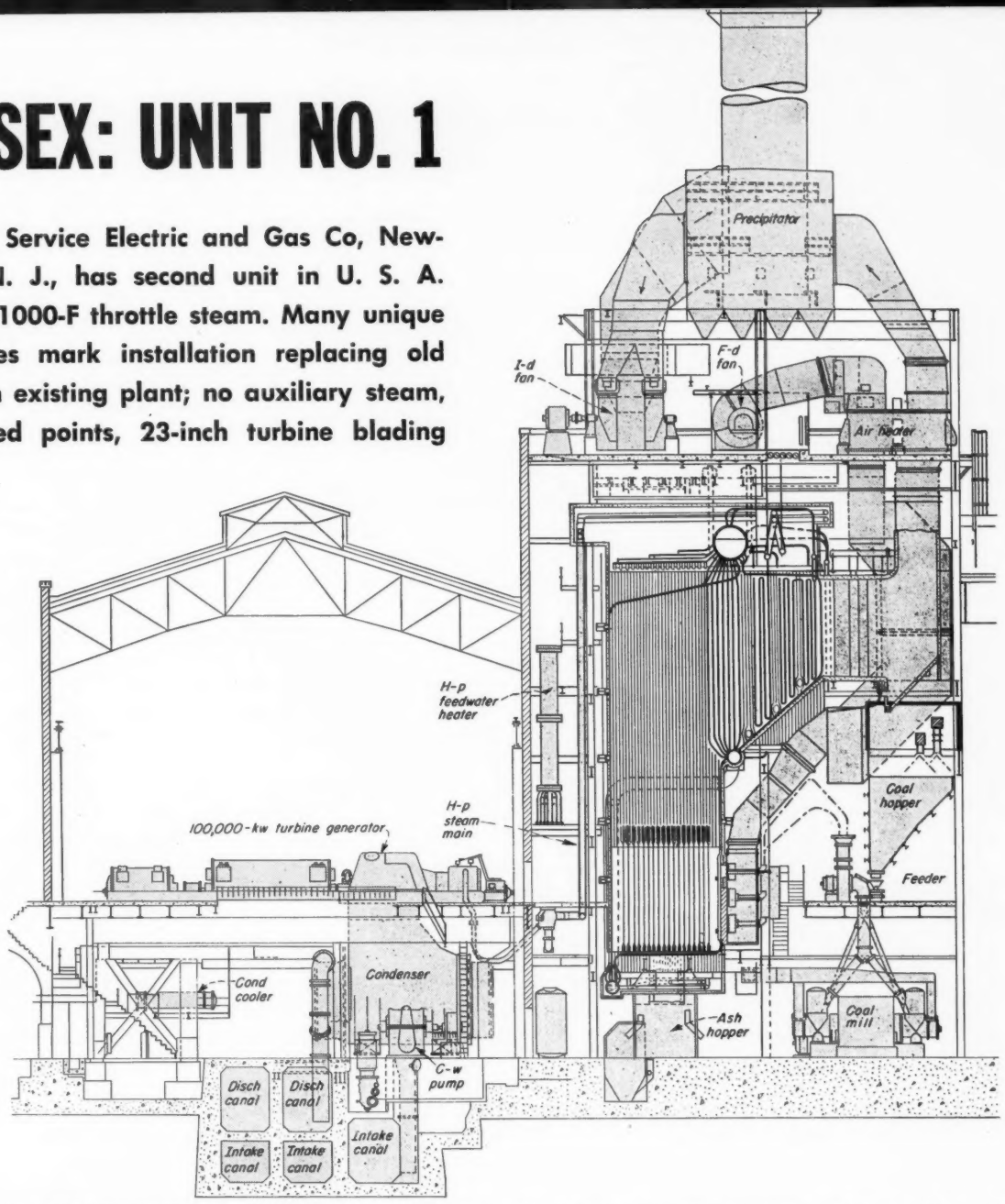
MISCELLANEOUS:

Heat pump .....Drayer-Hanson, Inc
Control air compressor.....Republic Flow Meters Co
Insulation .....Johns-Manville Co

CONSULTING ENGINEERS.....Ebasco Services, Inc

ESSEX: UNIT NO. 1

Public Service Electric and Gas Co, Newark, N. J., has second unit in U. S. A. using 1000-F throttle steam. Many unique features mark installation replacing old unit in existing plant; no auxiliary steam, 8 bleed points, 23-inch turbine blading



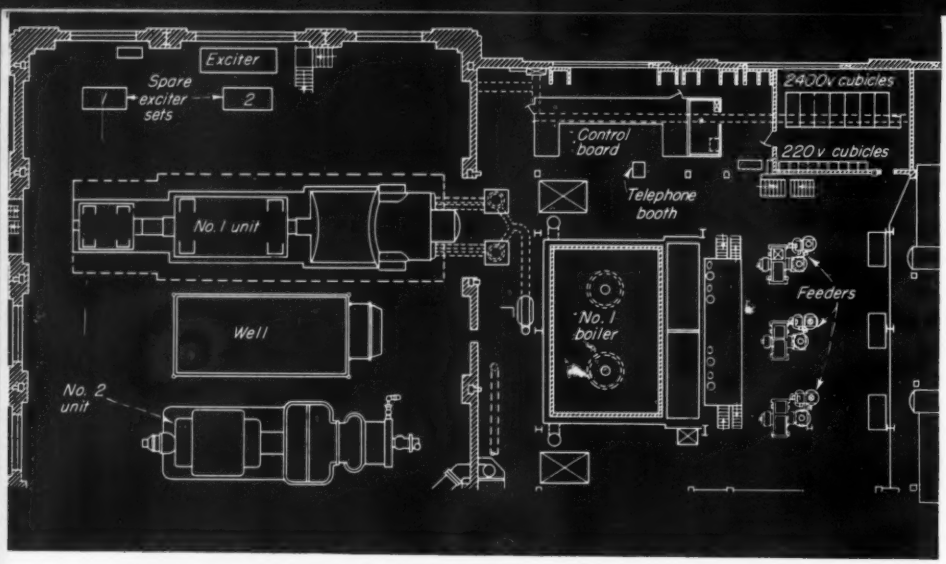
COMPACT ARRANGEMENT OF NEW UNIT results from placing 100,000 kw of capacity on same land area formerly occupied by 22,500-kw turbine-generator and four boilers. Most auxiliaries for steam generator are outdoors on boiler-room roof

▶ In December 1947, Public Service Electric and Gas Co placed in service at Essex Generating Station, in Newark, N. J., its new Unit No. 1, rated at 100,000 kw, 1250 psig, 1000 F. This tandem-compound machine, the second in this country to utilize 1000-F steam, has single-flow high-pressure and double-flow low-pressure turbines driving a 95,000-kw hydrogen-cooled main generator and 7500-kw air-cooled auxiliary generator. A common 500-hp motor drives separate exciters for small and large generators.

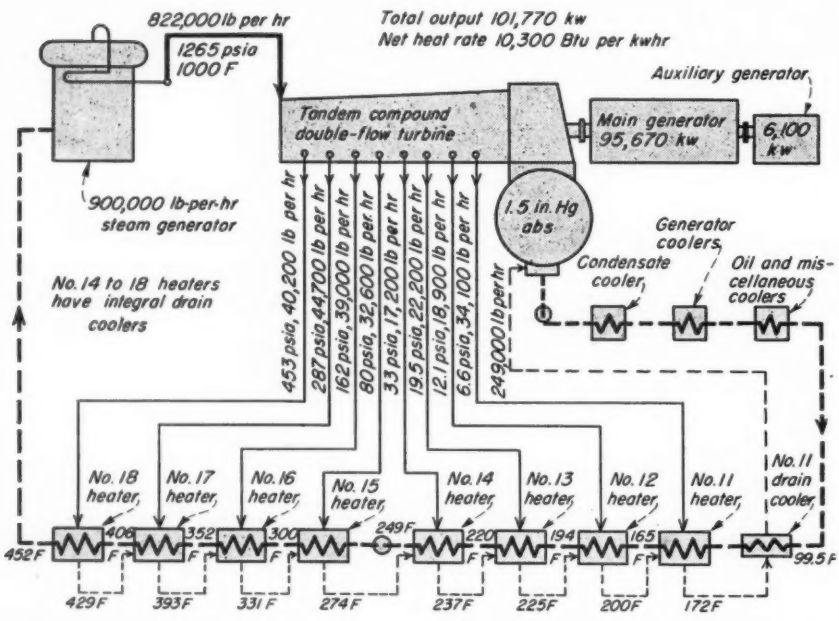
Turbines. With wide-open governor valves the unit produces a maximum output of 118,000 kw indicating a wide margin between rating and capability. The unit operates at 3600 rpm despite its size and establishes a record by being the first turbine to use 23-in. blades, in the last stage of the low-pressure double-flow turbine. This factor contributes both to compactness of the machine and efficiency of performance.

No. 1 presents a vivid example of the advance in the art of power engineering. The turbine-generator and its single steam generator capable of 118,000-kw output occupy the same ground area as the predecessor 22,500-kw turbine-generator and four boilers. The unit uses the original turbine-room building but it was necessary to provide a new building for the steam generator. Furthermore, the new unit's condenser uses the same circulating water tunnels as the original 22,500-kw unit it replaces, the water requirements being practically identical.

Steam Generator. The radiant boiler has a maximum continuous steam capacity of 900,000 lb per hr at a design pressure of 1500 psig and 1000-F temperature. Three ball mills supply the 12 combination pulverized-coal and mechanical atomizing oil burners that fire the 47,800-cu-ft slag-tap furnace. A center wall divides the furnace into two equal volumes up to the entrance of the boiler convection surface. In the flame area the waterwall tubes forming this wall are twisted to form large-area connecting ports between the two furnace



TURBINE-GENERATOR STANDS in existing turbine-room building, but new building was needed for steam generator; control board centralizes supervision for unit



EIGHT FEEDWATER HEATERS feature unit heat balance with all deaeration performed in main condenser only; all heater drains cascade back to condenser hotwell

halves and prevent creating any pressure differential. A spray-type attemperator between the two sections of the pendant superheater controls the outlet steam temperature. Heating surfaces of the steam generator are: boiler and waterwalls, 21,391 sq ft; superheater, 31,643 sq ft; economizer, 16,400 sq ft; regenerative air heaters, 211,800 sq ft.

Air for soot blowing also functions as the medium for power and control of the soot-blowing system. The blowers, automatically controlled from the board, are in boiler walls, superheater, economizer and air heaters.

The forced-draft and induced-draft fans, Ljungstrom heaters and precipitators are outdoors on the boiler-house roof. Air-cooled bearings provided on these units eliminate the need of cooling water, which would be subject to freezing troubles in winter. The totally enclosed induced-draft fan drive motors of 1000-hp capacity are insulated with silicone and, incidentally, are the largest of their type built to date.

A single short steam main between superheater outlet and turbine stop valves connect steam generator and turbine. There are no intermediate valves or branch steam lines in the high-pressure main. This simple design was achieved by eliminating all need for auxiliary steam. This has several advantages, such as avoiding the need for supervising and maintaining reducing valves, reduction in makeup water needs, minimizing water-treating costs, avoiding handling low-pressure drains, etc.

Auxiliaries. All station auxiliary service must obviously be provided electrically under this scheme. Air for soot blowing avoids demand for low-pressure steam and the practically "standard" steam-jet air ejector for the main condenser is replaced in this installation by two rotary vacuum pumps, operating in parallel. One pump can handle ordinary air leakage into the condenser, but the two pumps together do the service ordinarily provided by steam hogging jets. A secondary advantage of two pumps is that they serve as standby for each other.

The turbine has eight bleed points feeding eight closed feedwater heaters. Three l-p heaters are located in the main condenser steam inlet to keep the l-p bleed connections short and to save space. No heater condensate pumps are used, the condensate cascading back through all heaters to the main condenser. All deaeration of condensate takes place in the main condenser and hence no deaerating heater appears in the heat-balance cycle of the unit. The cycle uses three 1750-hp 3600-rpm boiler feed pumps driven by totally enclosed motors through hydraulic couplings. The coupling speed ratio responds to changes in steam flow to the boiler and drum-water level. The boiler feed valve, located in the supply line, will be used for emergency purposes only.

Coolers. The main unit condensate cools lubricating oil, hydrogen, bearings motors, couplings, etc. This helps to keep to a minimum salt-water piping, which is used only for compressors and other minor needs. During the summer when condensate temperature tends to run too high for cooling service, special condensate coolers are placed in service.

Station Features. A feature of the installation is the central control board, which supervises the turbine, generator, steam generator and feed pumps. The board is located so the operators can readily reach all main equipment.

The auxiliary generator on the main unit shaft supplies all the auxiliary drives. No normal interconnection between the unit auxiliary buses and the station bus exists, but in emergency the auxiliary supply can be drawn from the station bus. Normally the two buses are not kept synchronized.

The new unit has been installed for a unit cost of $93 per rated kw. This includes the cost of the new boiler-room superstructure, but not that of the old foundations and existing turbine building as shown in station cross section.

PRINCIPAL POWER-PLANT EQUIPMENT

No. 1 Unit, Essex Generating Station

Public Service Electric & Gas Co, Newark, N. J.

TURBINE-GENERATOR and AUXILIARIES:

Turbine-generator.....General Electric Co
100,000-kw 3600-rpm 24-stage tandem-compound double-flow turbine. 1250 psig, 1000 F, 1.5-in. Hg abs, 8 bleed points. Main generator, 95,000 kw, 85% pf, 13.8 kv, 3 phase, 60 cycle, hydrogen cooler, 25 psig. Auxiliary generator, direct connected, 7500 kw, 80% pf, 2400 v, 3 phase 60 cycle, air cooled. Separate exciters, 300 kw for main generator; 40-kw exciter for auxiliary generator

Surface condenser.....Westinghouse Electric Corp
55,000 sq ft, 2-pass, radial flow, deaerating hotwell, welded shell, divided cast-iron waterboxes, waterbox division valve

Condenser tubes.....Phelps Dodge Copper Products Co

Circulating water pumps, 2.....Westinghouse Electric Corp
27,000 gpm, 318 rpm, 31-ft head, 249 hp

Circulating-water-pump drives, 2.....Westinghouse Electric Corp
Constant speed, 300 hp, 318 rpm, 2300 v

Vacuum pumps, 2.....Kinney Manufacturing Co
600 cfm at 400 rpm, 1-in. Hg abs pressure

Vacuum-pump drives, two, 40 hp.....General Electric Co

STEAM-GENERATING EQUIPMENT:

Boiler and waterwalls, 1.....Babcock & Wilcox Co
Radiant boiler, heating surface including walls, floor and division wall, 21,391 sq ft; max continuous capacity, 900,000 lb per hr; 1500 psig, 1000 F; 47,800-cu-ft furnace volume

Superheater, attemperator, 31,643 sq ft.....Babcock & Wilcox Co

Economizer, 16,400 sq ft.....Babcock & Wilcox Co

Air heaters, 2.....Air Preheater Corp
105,900 sq ft, Ljungstrom, outdoor installation

Burners, 12, coal and oil.....Babcock & Wilcox Co

Boiler insulation.....H W Porter & Co

Boiler refractory and brickwork.....George Allen & Son

Ash hoppers and pump.....Allen-Sherman-Hoff Co

Coal pulverizers, 3.....Foster Wheeler Corp
Ball mills, double classifier and feed, 37,400 lb per hr each

Pulverizer drive motors, three, 350 hp.....Westinghouse Elec Corp

Coal feeders, 3, table type.....Foster Wheeler Corp

Coal-feeder drive motors, 3.....Westinghouse Electric Corp

Mill exhausters, 3, 19,400 cfm.....Foster Wheeler Corp

Mill-exhauster drive motors, 3.....Allis-Chalmers Mfg Co

Forced-draft fans, 2.....American Blower Corp
150,000 cfm at 125 F, 18.8 in. H_2O

Forced-draft-fan hydraulic couplings, 2.....American Blower Corp

Forced-draft-fan drive motors.....Allis-Chalmers Mfg Co
Constant speed, 600 hp, 1200 rpm, 2300 v

Induced-draft fans, 2.....American Blower Corp
Louver control, 263,000 cfm at 296 F, 15.4 in. H_2O

Induced-draft-fan drive motors, 2.....Westinghouse Elec Corp
Constant speed, 1000 hp, 600 rpm, 2300 v

Ducts and breeching.....Connery Construction Co

Duct and breeching insulation.....H W Porter & Co

Wall and superheater soot blowers.....Vulcan Soot Blower Corp

Economizer soot blowers.....Diamond Power Specialty Corp

Air-heater soot blowers.....Air Preheater Corp

Boiler gage glasses.....Diamond Power Specialty Corp

Remote level indicator.....Yarnall-Waring Co

Chemical feed pumps, low pressure.....Milton Roy Co

Automatic combustion control.....Bailey Meter Co

Fuel-oil pressure control.....Bailey Meter Co

COAL-HANDLING and DUST-COLLECTING EQUIPMENT:

Coal tower and barge puller.....McKiernan-Terry Corp

Coal conveyors.....Robins Conveyors, Inc

Coal scale, weightometer.....Merrick Scale Manufacturing Co

Conveyor drives.....Westinghouse Electric Corp

Redler conveyors, two, 110 t per hr.....Stephens-Adamson Mfg Co

Magnetic separators.....Ding's Magnetic Separator Co

Coal hoppers.....Heilman Boiler Works

Tractors and scrapers.....Caterpillar Tractor Co

Flyash collectors, 2.....Research Corp

Dust-handling equipment.....United Conveyor Corp

FEEDWATER SYSTEM:

High-pressure heaters, 4.....Foster Wheeler Corp
Vertical, internal drain coolers, 80-20 cupro-nickel tubes, 2300-psig working water pressure, 2410-sq-ft 550-psig steam press, 2119-sq-ft 340-psig steam press, 1890-sq-ft 227-psig steam press, 1955-sq-ft 111-psig steam press

Low-pressure heater, 1.....Foster Wheeler Corp
Horizontal, 2049 sq ft, 100 psig steam press, 250 psig water press, internal drain cooler, arsenical copper tubes

Low-pressure heaters, 2.....Westinghouse Electric Corp
1800 sq ft, 100 psig steam press, 300 psig water press. Admiralty tubes, horizontal. Heaters located in turbine exhaust connection

Low-pressure heater.....Westinghouse Electric Corp
2700 sq ft, 100 psig, steam press, 300 psig water press. Admiralty tubes, horizontal, in turbine exhaust connection

Low-pressure drain cooler, 3000 sq ft.....Westinghouse Electric Corp

Heater-drainage controllers.....Fisher Governor Co

Condensate coolers, two, 1935 sq ft.....Condenser Service & Engrg Co

Condensate and pumps, 2.....Worthington Pump Mach Corp

Condensate-pump motors.....Westinghouse Electric Corp

Boiler-feed pumps, 3.....Worthington Pump & Machinery Corp
1174 gpm, 4050-ft head

Boiler-feed pump hydraulic couplings.....American Blower Corp

Boiler-feed pump motors, 3.....Westinghouse Electric Corp
1750 hp, 2300 v, 3600 rpm

Boiler-water recirculating pump, 1, 70 gpm.....Hankison Co

Feedwater control, 3-element.....Bailey Meter Co

Feedwater storage-tank pumps, two, 600 gpm.....Ingersoll-Rand Co

PIPING:

High-pressure fabricated piping.....M W Kellogg Co

Intermediate and low-pressure piping.....Midwest Piping & Supply Co; Cornell & Underhill, Inc

Circulating-water piping.....Warren Foundry & Pipe Co

Blowdown valves, 3.....Yarnall-Waring Co

H-p steel gate, globe and check valves.....Lunkenheimer Co

L-p steel gate, globe and check valves.....Wm Powell Co

Small high-pressure valves.....Edward Valves Inc; Lunkenheimer Co

Small l-p valves.....Hancock Div, Manning, Maxwell & Moore, Inc

Iron gate, globe and check valves.....Crane Co

Large iron butterfly valves, circulating water.....Henry Pratt Co

Bleed-steam check nonreturn valves.....Schutte & Koerting Co

Small bronze valves.....Lunkenheimer Co

Constant-load spring hanger.....Grinnell Co

Inspection.....Hartford Steam Boiler Inspection & Insurance Co

Pipe insulation.....Philip Carey Co

Relief valves, heaters.....Farris Engineering Co; Consolidated Div, Manning Maxwell & Moore

Soot-blower air relief valves
Consolidated Division, Manning, Maxwell & Moore

Boiler drum and superheater relief valves
Consolidated Division, Manning, Maxwell & Moore

MISCELLANEOUS EQUIPMENT:

Surge tank, 10,000 gal.....Heilman Boiler Works

Compressed air receivers, 3.....M W Kellogg Co; Buffalo Tank Corp

Gland seal tank, 455 gal.....McCarter Iron Works

Drain tank.....Heilman Boiler Works

Acid cleaning tanks, two, 10,000 gal.....McCarter Iron Works

Lubricating-oil storage tank, 4500 gal.....Heilman Boiler Works

Boiler meters and recorders.....Bailey Meter Co

Draft gages.....Ellison Draft Gage Co

Feedwater flow indicator.....Republic Flow Meter Co

Pressure gages.....Ashcroft Div, Manning, Maxwell & Moore, Inc

Speed and cam-shaft position recorder.....General Electric Co

Shell differential expansion recorder.....General Electric Co

Bearing vibration amplitude recorder.....General Electric Co

Hotwell level and makeup control.....Hagan Corp

H_2 and CO_2 control and indication.....General Electric Co

Industrial thermometers, vacuum column.....Taylor Instrument Co's

Temperature and conductivity recorders.....Leeds & Northrup Co

Fuel-oil meters.....Neptune Meter Co

Limitorque valve operators.....Philadelphia Gear Works

CO_2 recorder.....Leeds & Northrup Co

High and low coal level indicators for hoppers.....Fuller Co

Sample cooling coils.....Parker Appliance Co

Service water pumps, two, 2500 gpm.....De Laval Steam Turbine Co

Boiler-room elevator.....Otis Elevator Co

Fire-protection equipment.....Acme Rubber Manufacturing Co; American-LaFrance Foamite Corp; Blaw-Knox Co; C-O-Two Fire Equipment Co; Davis Emergency Equipment Co; Mine Safety Appliance Co; Walter Kidde & Co; Wirt & Knox Manufacturing Co

Air compressor, 1, 1000 cfm.....Worthington Pump & Mach Corp

Air compressor, control air.....Ingersoll-Rand Co

Acid cleaning pumps, 2.....Worthington Pump & Machinery Corp

Hoists and trolleys.....Ingersoll-Rand Co; Philadelphia Chain Block & Mfg Co, Inc; Wright Mfg Div, American Chain and Cable Co

Ventilating equipment.....American Blower Corp; De Bothezat Div, Amer Machine & Metals Co; H H Robertson Co

1948 Listing of Typical Central-Station

For Notes on Uses and Limitations of this Tabulation • See page 122

Compiled by B G A Skrotzki, Associate Editor

Company	Location	Plant Name	Consulting Engineers	First Operation, New Units	Nominal Pressure, psi	Nominal Steam Temperature, F	BOILERS: Number	BOILERS: Capacity, Each 1000 lb per hr	BOILERS: Manufacturer	BOILERS: Superheater Surface, 1000 sq ft	BOILERS: Boiler, Waterwall Surface, 1000 sq ft	Furnace Volume, 1000 cu ft	Heat release, 1000 Btu per cu ft per hr	Furnace Bottom
1500 PSI AND ABOVE														
Appalachian Elec Pwr Co	Graham Sta, W. Va	Philip Sporn	Amer Gas & Elec Serv	7-49	2080	1050[1]	1	930	BW	60.5[2]	29.6	79.8	16.4	DB
The Ohio Power Co	Graham Sta, W. Va	Philip Sporn	Amer Gas & Elec Serv	6-50	2080	1050[1]	1	930	BW	60.5[2]	29.6	79.8	16.4	DB
Indiana & Mich Elec Co	Mishawaka, Ind	Twin Branch	Amer Gas & Elec Serv	5-49	2080	1050[1]	1	930	BW	60.5[2]	23.5	65.7	19.8	ST
City of Detroit Pub Ltg Comm	Detroit, Mich	Mistersky	SH & G, B & R	1950	1675	1000	1	400	BW	16.4	6.8	22.6	19.6	DB
Consolidated Edison Co of N Y	Manhattan, N. Y. C.	Waterside No.1		12-48	1600	950	1	1000	CE	28.2	30.3	61.0	17.1	ST
				12-48	1600	950	1	1000	CE	28.2	30.3	61.0	17.1	ST
				1948	200	500	.	....	....	....	....	....	....	....
				1948	200	500	.	....	....	....	....	....	....	....
Consolidated Edison Co of N Y	Bronx, N. Y. C.	Sherman Creek		10-47	1600	950	1	1000	CE	28.2	59.0	53.7	21.9	ST
Columbus & So. Ohio Elec Co	Nr. Athens, Ohio	Poston	Ebasco Services	6-49	1500	955	1	425	FW	25.5	12.5	30.6	17.9	DB
				6-50	1500	955	1	425	FW	25.5	12.5	30.6	17.9	DB
Consolidated Edison Co of N Y	Manhattan, N. Y. C.	East River		6-50	1500	1000	1	1100	BW	39.1	21.8	88.0	15.5	DB
				4-51	1500	1000	1	1100	BW	39.1	21.8	88.0	15.5	DB
Iowa Power & Light Co	Des Moines, Iowa	Des Moines No. 2		6-48	1500	925	1	375	CE	13.0	9.7	25.0	18.0	DB
1200 PSI TO 1499 PSI														
Boston Edison Co	Weymouth, Mass	Edgar	Jackson & Moreland	9-49	1450	1000[1]	1	585	CE	....	....	....	....	DB
Buffalo Niagara Elec Corp	Dunkirk, N. Y.	Dunkirk		1950	1450	1000[1]	1	670	CE	38.6[11]	....	58	15.9	DB
				1950	1450	1000[1]	1	670	CE	38.6[11]	....	58	15.9	DB
Metropolitan Edison Co	Reading, Pa	Titus	Gilbert Associates	11-50	1450	1000[1]	1	510	CE	34.7[11]	29.3	44.6	15.8	DB
				11-50	1450	1000[1]	1	510	CE	34.7[11]	29.3	44.6	15.8	DB
New England Power Co	Salem, Mass	Salem Harbor	United Engrs & Const	5-51	1450	1000[1]	1	....	....	....	....	....	....	....
				10-51	1450	1000[1]	1	....	....	....	....	....	....	....
The Ohio Power Co	Brilliant, Ohio	Tidd	Amer Gas & Elec Serv Corp	8-48	1375	925	1	950	BW	34.7	24.2	66.5	17.1	DB
Florida Power & Light Co	Cutler, Fla	Cutler	Ebasco Services	1949	1350	955	1	430	CE	....	16.9	22.0	24.4	....
				1949	650	835	1	150	CE	3.5	13.3	6.0	32.3	....
				1949	650	835	1	150	CE	3.5	13.3	6.0	32.3	....
City Public Service Board	San Antonio, Texas	Mission Road	Gibbs & Hill	7-48	1350	900	1	325	BW	....	....	14.1	30.4	....
Pacific Gas & Electric Co	Bakersfield, Calif	Kern	Stone & Webster	5-48	1350	925	2	450	BW	15.0	9.5	18.4	32.3[21]	....
West Penn Power Co	Nr. Courtney, Pa	Mitchell	Sanderson & Porter	12-48	1350	925	2	500	BW	21.4	16.6	44.1	13.6	DB
				2-50	1350	925	1	500	BW	21.4	16.6	44.1	13.6	DB
West Penn Power Co	Springdale, Pa	Springdale	Sanderson & Porter	12-45	1250	925	1	800	BW	34.7	23.2	62.6	15.4	DB
Nebraska Public Power System	Bellevue, Nebr	Bellevue	Sargent & Lundy	6-49	1325	950	3	220	BW	12.1	9.07	14.5	18.0	DB
Pacific Gas & Electric Co	San Francisco, Calif	Station P	Stone & Webster	11-48	1300	950	4	475	BW	16.4	8.6	20.6	31.0[23]	....
Cambridge Electric Light Co	Cambridge, Mass	Kendall Sq	Gilbert Associates	12-48	1320	900	2	200	BW	7.9	9.9	14.3	17.4	DB
The Dayton Power & Light Co	Miamisburg, Ohio	O H Hutchings	Ebasco Services	5-48	1300	950	1	550	CE	15.8	16.4	31.6	18.8	DB
				1949	1300	950	1	550	CE	15.8	16.4	31.6	18.8	DB
The Detroit Edison Co	Trenton, Mich	Trenton Channel		8-49	1300	950	4	660[16]	CE	....	26.6	42.2	17.4	DB
Wisconsin Electric Power Co	Port Washington, Wis	Port Washington		9-48	1290	825[24]	1	690	CE	8.5[25]	64.2	61.0	14.4	DB
				6-49	1380	900[26]	1	655	CE	11.0[27]	63.8	61.0	14.4	DB
Buffalo Niagara Elec Corp	Nr. Buffalo, N. Y	C R Huntley		9-48	1250	950	1	875	BW	29.1	18.4	38.8	25.8	ST
Central New York Power Corp	Oswego, N. Y	Oswego		12-48	1250	950	1	875	BW	27.2	17.4	43.5	23.1	ST
The Cincinnati Gas & Elec Co	Cincinnati, Ohio	West End		11-48	1250	925	3	350	BW	15.6	19.8	12.3	35.7	ST
The Cincinnati Gas & Elec Co	Columbia Park, Ohio	Columbia	Sargent & Lundy	11-49	1250	950	2	375	BW	24.2	22.6	31.8	14.6	DB
N.Y.C. Board of Transportation	Manhattan, N. Y. C.	59th Street	Burns & Roe	10-49	1250	950	1	600	BW	30.6	12.3	34.6	18.8	DB
Duke Power Co	Cliffside, N. C.	Cliffside		3-48	1250	950	1	620	CE	24.3	24.0	39.0	19.2	DB
				11-48	1250	950	1	620	CE	24.3	24.0	39.0	19.2	DB
Duke Power Co	Leaksville, N. C.	Dan River		11-49	1250	950	1	670	CE	24.8	27.3	42.9	18.6	DB
				4-50	1250	950	1	670	CE	24.8	27.3	42.9	18.6	DB
Connecticut Light & Power Co	Devon, Conn	Devon	United Eng & Constr	1-50	1250	950	1	600	CE	....	19.7	40.0	17.5	DB
				1-51	1250	950	1	600	CE	....	19.7	40.0	17.5	DB
Long Island Lighting Co	Port Jefferson, L. I	Port Jefferson	Ebasco Services	9-48	1250	950	1	425	CE	16.2	15.6	29.2	18.0	DB
				11-49	1250	950	1	425	CE	16.2	15.6	29.2	18.0	DB
New Orleans Pub Service, Inc	New Orleans, La	Industrial Canal	Ebasco Services	7-47	1250	950	1	400	FW	13.5	16.0	28.1	20.1	DB
				8-48	1250	950	1	400	FW	13.5	16.0	28.1	20.1	DB
			Sanderson & Porter	2-49	1250	950	1	500	BW	25.6	16.6	41.7	14.0	DB
Oklahoma Gas & Elec Co	Harrah, Oklahoma	Horseshoe Lake	Pioneer Serv & Engrg Co	7-47	1250	950	1	290	BW	13.7	9.5	22.0	19.0	DB
Rochester Gas & Electric Corp	Nr. Charlotte, N. Y	Lakeside	Gilbert Associates	10-48	1250	950	1	400	CE	....	15.1	27.1	16.2	DB
Narragansett Electric Co	Providence, R. I	Manchester St	United Engrs & Constr	10-47	1200	950	1	450	CE	14.9	15.3	24.0	22.1	DB
				4-49	1200	950	1	450	CE	14.9	15.3	24.0	22.1	DB
900 PSI TO 1199 PSI														
Arkansas Power & Light Co	Lake Catherine, Ark	Lake Catherine	Ebasco Serv	....	1050	905	2	450	CE	....	....	21.0	....	....
Los Angeles Dept of Water & Pwr	Wilmington, Calif	Harbor		11-47	1050	900	1	570	RS	23.3	30.9	22.5	32.2	....
				11-48	987	900	1	650	RS	29.0	32.4	28.0	28.5	....
				12-48	987	900	1	650	RS	29.0	32.4	28.0	28.5	....
				4-49	987	900	1	650	RS	29.0	32.4	28.0	28.5	....
Gulf States Utilities Co	Lake Charles, La	Riverside	Stone & Webster	8-47	925	825	1	420	FW	....	....	....	....	....
	Baton Rouge, La	Louisiana[34]	Stone & Webster	7-50	900	910	1	400	CE	7.7	26.2	20.5	26.5	....
				5-50	900	900	1	400	CE	7.7	26.2	20.5	26.5	....
	Beaumont, Texas	Neches	Stone & Webster	2-51	900	900	1	400	CE	7.7	26.2	20.5	26.5	....
				5-49	875	910	1	400	CE	8.5	13.6	18.0	28.9	....
				10-51	875	910	1	400	CE	8.5	13.6	18.0	28.9	....
Florida Power & Light Co	Miami, Florida	Miami	Ebasco Services	6-48	920	905	2	215	BW	5.6	18.0	9.5	30.2	....
Louisiana Power & Light Co	Sterlington, La	Sterlington	Ebasco Services	5-51	900	905	1	675	CE	....	....	....	....	....
Columbus & So. Ohio Elec Co	Nr. Columbus, Ohio	Peiway		7-48	900	900	1	375	FW	9.8	14.4	18.8	25.1	ST
Duquesne Light Co	So. Heights, Pa	Phillips		12-49	900	900	1	600	FW	17.8	....	....	20.9	DB

A —Air cooled
AAlBr —Arsenical aluminum-brass
AAd —Arsenical admiralty
AlB —Aluminum-bronze
AlBr —Aluminum-brass
AC —Allis-Chalmers Mfg Co
Ad —Admiralty
Ads —Admiralty, stabilized
AnAd —Antimony-admiralty
AsCu —Arsenical copper
B&R —Burns and Roe
BW —Babcock & Wilcox Co
C —Coal, bituminous
CA —Coal, anthracite
CB —Coke breeze
CE —Combustion Engineering Co
Cu Ni —Cupro-nickel
Cu —Copper
DL —DeLaval Steam Turbine Co
D —Damper
DB —Dry bottom
EC —Erie City Iron Works
El —Elliott Co
EM —Edge Moor Iron Works
FW —Foster Wheeler Corp
G —Natural gas
GE —General Electric Co
GT —Gas tar
H —Hydrogen cooled
Hy —Hydraulic coupling
L —Lignite
M —Motor drive
Ma —Magnetic coupling
MI —Murray Iron Works Co
Mp —Two motors per fan
MT —Motor and turbine drive
Mu —Muntz metal
O —Oil
P —Pulverized-fuel firing
PAd —Phosphorized admiralty
Pl —Plate
R —Regulator
RB —Red brass
Re —Regenerative
RS —Riley Stoker Corp
S —Speed control
SH&G —Smith, Hinchman and Grylls
SS —Spreader stoker
ST —Slag tap
Su —Superloy
T —Turbine drive
TG —Traveling-grate stoker

and Municipal Power-Plant Installations

Economizer Surface per Boiler, 1000 sq ft	Air-Heater Surface per Boiler, 1000 sq ft	Air-Heater Type	F-D FANS: Drive	F-D FANS: Air-Volume Control	I-D FANS: Drive	I-D FANS: Gas-Volume Control	Firing	FUEL: Type	FUEL: Heating Value, 1000 Btu per lb	FUEL: Ash-Fusion Temperature, F	FEED PUMPS: Drive	FEED PUMPS: Flow Control	TURBINES: Capacity, 1000 kw	TURBINES: Speed, rpm	TURBINES: Manufacturer	TURBINES: Back pressure, psia	TURBINES: No. of Bleed Points	Generator Cooling	CONDENSERS: Surface, 1000 sq ft	CONDENSERS: No. Water Passes	CONDENSERS: Tube Material	Total Boiler Capacity Incl New Units, 1000 lb	Total Generator Capacity Incl New Units, 1000 kw
14.3	281.4	Re	M	V	M	V	P	C	11.4	2300	3M	R	125	3600[33]	GE	0.5	6	H	65.0	1	AsCu	930	125
14.3	281.4	Re	M	V	M	V	P	C	11.4	2300	3M	R	125	3600[33]	GE	0.5	6	H	65.0	1	AsCu	1860	250
17.2	281.4	Re	M	V	M	V	P	C	10.9	2200	3M	R	125	3600[33]	GE	0.5	6	H	65.0	1	AsCu	3460	366.5
13.7	94.0	Tu	M	V	M	Hy	P	C	13.0	2300	2M	Hy	44	3600	WE	0.25	4	H	27.5	1	Ad	1250	120
34.0	260.0	Re	M[3]	V	M[3]	D	P	C	13.0[4]	2400[5]	3T	S	50	3600	WE	200	1[6]	H	....	..	.....	2000	.....
34.0	260.0	Re	M[3]	V	M[3]	D	P	C	13.0[4]	2400[5]	3T	S	50	3600	WE	200	1[6]	H	....	..	.....	2000	.....
....	.....	...	....	.....	....	.....	.....	.....	.....	.....	.....	....	60	1800	GE	0.75	2[8]	H	74.5	2	AlB	.....	.....
....	.....	...	....	.....	....	.....	.....	.....	.....	.....	.....	....	60	1800	GE	0.75	2[8]	H	74.5	2	AlB	.....	658
34.0	260.0	Re	MT[7]	S	MT[7]	S	P	C&O	14.3	2095	3T	S	50	3600	GE	200	1[6]	H	....	..	.....	3476	265
24.9	137.2	Re	M	D	M	D	P	C	11.5	2400	3	....	40	3600	WE	.....	..	H	37.5	2	AsCu	425	40
24.9	137.2	Re	M	D	M	D	P	C	11.5	2400	3	....	40	3600	WE	.....	..	H	37.5	2	AsCu	850	80
42.0	254.8	Re	....	.....	....	.....	P	C	13.0[9]	2400[5]	3T	S	120	3600[33]	GE	0.5	3	H	95.0	1	AlB	5550	400
42.0	254.8	Re	....	.....	....	.....	P	C	13.0[9]	2400[5]	3T	S	120	3600[33]	GE	0.5	3	H	95.0	1	AlB	6550	520
5.7	40.6	Re	M	V	M	Hy	P	C, G	9.2[10]	1980	.....	....	.....	.....	...	.....	..	..	.....	..	.....	1300	85
....	.....	Re	M	V	M	S	P	C	14.1	2500	2M	....	81.25	3600	WE	0.5	5	H	....	1	AlBr	2375	242
15.4	232.2	Re	M[3]	.....	M[3]	.....	P	C	13.1	2050	3M	....	80	3600	GE	0.5	7	H	50	1	Ad	670	80
15.4	232.2	Re	M[3]	.....	M[3]	.....	P	C	13.1	2050	3M	....	80	3600	GE	0.5	7	H	50	1	Ad	1340	160
10.5	204.4	Re	M	Hy	M	V	P	C	13.0	2400	1M	Hy	60[12]	3600	GE	0.5	5	H	42.5	2	Ad	510	75
10.5	204.4	Re	M	Hy	M	V	P	C	13.0	2400	1M	Hy	60[12]	3600	GE	0.5	5	H	42.5	2	Ad	1020	150
....	.....	...	....	.....	....	.....	.....	.....	.....	....	.....	....	75	3600	GE	.....	..	H	....	..	.....	....	75
....	.....	...	....	.....	....	.....	.....	.....	.....	....	.....	....	75	3600	WE	.....	..	H	....	..	.....	....	150
18.8	281.4	Re	M	V	M	V	P	C	11.3	2400	3M	R	100	1800	GE	0.5	5	H	58	1	AsCu	1900	200
....	63	Re	M	D	M	D	O	O	18.3	....	2M, 1T	....	40	3600	GE	1.13	5	H	40	2	AlBr	430	40
0	20	Re	M	D	M	D	O	O	18.3	....	1M	....	11.5	3600	El	1.0	4	A	11.0	2	AlBr	580	51.5
0	20	Re	M	D	M	D	O	O	18.3	....	1T	....	11.5	3600	El	1.0	4	A	11.0	2	AlBr	730	63
7.5	41.7	Tu	Mp	V	Mp	V	G, O	G, O	107[013]	....	1M, 1T	R	25	3600	WE	1.0	4	H	22.5	2	PAd	1143	80
6.9	67.6	Tu	M[22]	V	M[22]	V	G, O	G, O	100[913]	....	3M	R	60	1800	GE	1.37	4	A	35.0	1	Ad	900	60
										....			6	3600	GE	2.0	1	A	4.0	1	Ad	900	66
11.6	67.4	Tu	M	V	M	D	P	C	12.0	2200	3M	....	80	3600	WE	.75	4	H	50	1	Su	1000	80
11.6	67.4	Tu	M	V	M	D	P	C	12.0	2200	3M	....	80	3600	WE	.75	4	H	50	1	Su	1500	160
18.8	108	Tu	M	V	M	V	P	C	12.5	2500	3M	....	80	3600	WE	.75	4	H	50	1	AAd	3485	290
5.4	40.3	Re	M	V	M	Hy	P	C	12.0	2000	3M, 1T	R	30[14]	3600	GE	0.5	4	H	27.5	1	AsCu	660	60
6.9	67.6	Tu	M[22]	V	M[22]	V	G, O	G, O	100[913]	....	5M	R	100[14]	3600	GE	0.75	4	H	40.0	1	AlBr	....	235
													7.5[14]	3600	GE	2.0	1	A	4.0	1	AlBr	....	250
5.4	46.1	Tu	Mp	D, V	T	D, V	P	C, O	14.0	2549	3T	S	15	3600	WE	1	1[15]	H	13	2	AlBr	400	15
20.5	43.2	Re	M	V	M	Hy	P	C	13.2	2600	3M	R	50	3600	GE	0.75	5	H	45	2	Ad	550	50
20.5	43.2	Re	M	V	M	Hy	P	C	13.2	2600	3M	R	50	3600	GE	0.75	5	H	45	2	Ad	1100	100
18.8	57.4	Re	M	Hy	M	Hy	P	C	13.5[16]	2500	3M	Hy	100[14]	1800	GE	0.5	5	H	60	1	Ad	6865	500
0	121	Pl	M	Ma	M	Ma	P	C	11.4	2156	2M, 1T	....	80	1800	AC	0.25	5	H	53.7	1	AAd	2070	240
0	145.2	Pl	M	Ma	M	Ma	P	C	11.4	2156	2M, 1T	....	80	1800	AC	0.25	5	H	53.7	1	AAd	2725	320
19.4	163	Tu	M[3]	V	M[3]	Ma	P	C	12.8	2100	3M	Hy	80	3600	WE	0.5	6	H	58.6	1	Ad	8575	320
24.0	158	Tu	M	V	M	Ma	P	C	13.0	2550	3M	Hy	80	1800	GE	0.5	6	H	58.6	1	Ad	2650	240
7.5	53.1	Tu	M	V	M	D	P	C	13.9	2480	3T	R	35	3600	WE	275	0	H	....	..	.....	1950	214
8.2	10.4	Re	M	V	M	Hy, D	P	C	13.3	2480	3M	R	80	3600	WE	0.75	4	H	60	2	AsCu	3215	336
17.8	197.0	Tu	M	V	M	Hy	P	C, O	13.3[28]	2400[29]	3M	Hy	50	1500	GE	0.5	5	H	55	2	AlB	2600	160
18.6	162.6	Re	M	Hy	M	Hy	P	C	12.3	2300	2M	....	65	3600	WE	0.75	5	H	48.5	2	Ad	1370	145
18.6	162.6	Re	M	Hy	M	Hy	P	C	12.3	2300	2M	....	65	3600	GE	0.75	5	H	48.5	2	Ad	1990	210
23.0	131.2	Re	M	V	M	Hy	P	C	.....	....	3M	....	70	3600	GE	0.75	6	H	50	2	Ad	670	70
23.0	131.2	Re	M	V	M	Hy	P	C	.....	....	3M	....	70	3600	GE	0.75	6	H	50	2	Ad	1340	140
18.8	249.8	Re	M	V	M	Hy	P	C	12.5	2400	2M	R	60	3600	WE	0.5	5	H	50.0	2	AlBr	....	225
18.8	249.8	Re	M	V	M	Hy	P	C	12.5	2400	2M	R	60	3600	WE	0.5	5	H	50.0	2	AlBr	2650	260
13.6	96.0	Re	M	V	M[3]	V	P	C, O	13.5	2200	2M	S, Hy	40	3600	GE	1.25	5	H	37.5	2	AlBr	425	40
13.6	96.0	Re	M	V	M[3]	V	P	C, O	13.5	2200	2M	S, Hy	40	3600	GE	1.25	5	H	37.5	2	AlBr	850	80
16.9	85.0	Re	M	V	M	D	G	G, O	110[013]	....	3M	R	37.5	3600	GE	1.75	4	H	30.0	2	AlBr	400	37.5
16.9	85.0	Re	M	V	M	D	G	G, O	110[013]	....	3M	R	37.5	3600	GE	1.75	4	H	30.0	2	AlBr	800	75
8.7	67.4	Tu	M	V	M	V	P	C	13.0	2050	3M	R	40	3600	WE	0.75	4	H	35.0	1	AAd	500	50
6.8	43.0	Re	M	Hy	M	Hy	P	C, G	11.5	1950	2M	R	10.0	3600	GE	315	..	A	....	..	.....	1089	92.3
14.1	100	Re	M	V	M	V	P	C	13.0	2100	3M	2R,1Hy	40	3600	GE	0.5	5	H	25	2	Ad	400	40
18.4	57.4	Re	M	V	M	Hy	P, O	C, O	14.0	2100	2M	R	40	3600	WE	0.5	5	H	27.5	1	CuNi	1195	116
18.4	57.4	Re	M	V	M	Hy	P, O	C, O	14.0	2100	2M	R	40	3600	GE	0.5	5	H	30.0	..	CuNi	1645	166
0	66.0	Tu	M	V	M	.....	O, G	G, O	.....	....	2M, 1T	R	40[14]	3600	AC	0.75	5	H	27.5	1	Ad	900	80
12.0	66.3	Re	M	S	M	S	O	O	18.1	....	2M, 1MT	R	65	3600	WE	0.5	4	H	60	2	AlBr	1140	130
7.0	158.0	Re	M	V	M	V	O	O	18.1	....	3M, 1T	Hy	75	1800	WE	0.75	4	H	70	2	AlBr	1790	205
7.0	158.0	Re	M	V	M	V	O	O	18.1	....	3M, 1T	Hy	75	1800	GE	0.75	4	H	70	2	AlB	2440	280
7.0	158.0	Re	M	V	M	V	O	O	18.1	....	3M, 1T	Hy	75	1800	WE	0.75	4	H	70	2	Ad	3090	355
....	.....	Re	M	V	M	V	G	G, O	100[013]	....	2M, 1T	....	35	3600	AC	1.0	..	..	35	..	.....	....	35
0	72.7	Re	M	V	M	V	G, O	G, O	100[013]	....	2M	R	40	3600	AC	1.0	5	H	35	..	.....	820	75
0	72.7	Re	M	V	M	V	G, O	G, O	100[013]	....	2M	R	40	3600	WE	1.0	5	H	35	..	Ad	3950	148.5
0	72.7	Re	M	V	M	V	G, O	G, O	100[013]	....	2M	R	40	3600	WE	1.0	5	H	35	..	Ad	4350	188.5
13.1	62.4	Re	M	V	M	V	G, O	G, O	106[013]	....	2M	R	40	3600	WE	1.0	5	H	37.5	2	Ad	1450	125
13.1	62.4	Re	M	V	M	V	G, O	G, O	106[013]	....	1M, 1T	R	40	3600	WE	1.0	5	H	37.5	2	Ad	1850	165
0	22.6	Re	M	V	M	V	O	O	18.3	....	2M, 1T	S	40	3600	GE	1.12	5	H	40	2	AlBr	....	74
0	104.7	Tu	....	.....	....	.....	G	G	106[213]	.....	.....	....	60	3600	GE	.....	4	..	....	..	.....	.....	.....
6.0	61.6	Re	M	Ma	M	Ma	P	C	11.5	2470	1T	S	30	3600	GE	0.75	4	H	35	2	AsCu	1415	120
13.8	161.6	Re	M	V	M	D	P	C	11.3	2100	1M	R	81.3	3600	WE	0.75	5	H	50	1	Ad	1460	150

Tu —Tubular
UF —Underfeed stoker
UI —Union Iron Works
V —Vane control
Vo —Henry Vogt Machine Co
WE —Westinghouse Electric Corp
Wi —Wickes Boiler Co
Wo —Worthington Pump & Mach Corp
(123) —Stoker grate area, sq ft

1—Reheat to 1000 F
2—Reheater surface, 30,200 sq ft
3—2 fans per boiler
4—12,000 to 14,000 Btu per lb
5—2000 to 2900 F
6—Bleed at 400 psia
7—1 motor, 1 turbine, 2 fans, 1 shaft
8—One bleed point for induction steam
9—12,000 to 13,900 Btu per lb
10—Gas, 1015 Btu per cu ft
11—Reheater surface, 9500 sq ft
12—60,000-kw rating, 75,000-kw max
13—Btu per cu ft
14—2 turbines being installed
15—Extraction at 200 psig for industrial sales
16—600,000 lb per hr with 12,640-Btu subnormal coal
17—Floating power plant
18—Bought in 1946, built in 1943
19—2 units of 1 motor driving one i-d, one f-d fan
20—Cupro-nickel in top rows of condenser
21—Gas-fired, 30,350 Btu on oil
22—An i-d and f-d fan driven by one motor
23—Gas-fired, 29,800 Btu on oil
24—Reheat to 835 F
25—Radiant reheater, 2964 sq ft
26—Reheat to 900 F
27—Radiant reheater, 3414 sq ft
28—12,330 to 14,400 Btu per lb
29—2045 to 2800 F
30—12,416 to 14,066 Btu per lb
31—Coke breeze; gas tar 165,000 Btu per gal
32—Started operation Jan 1948
33—H-p element 3600 rpm, l-p element 1800 rpm
34—See also 1949 unit at 650 psi

1948 Listing of Typical Central-Station and

For Notes on Uses and Limitations of this Tabulation • See page 122

Compiled by B G A Skrotzki, Associate Editor

Company	Location	Plant Name	Consulting Engineers	First Operation, New Units	Nominal Pressure, psi	Nominal Steam Temperature, F	BOILERS: Number	BOILERS: Capacity, Each 1000 lb per hr	BOILERS: Manufacturer	BOILERS: Superheater Surface, 1000 sq ft	BOILERS: Boiler, Waterwall Surface, 1000 sq ft	Furnace Volume, 1000 cu ft	Heat release, 1000 Btu per cu ft per hr	Furnace Bottom	Economizer Surface per Boiler, 1000 sq ft	Air-Heater Surface per Boiler, 1000 sq ft
Houston Lighting & Power Co	Houston, Texas	Greens Bayou	Ebasco Services	6-49	900	900	1	675	RS	....	31.6	30.0	31.0	....	13.7	67.0
				6-49	900	900	1	675	RS	....	31.6	30.0	31.0	....	13.7	67.0
Jersey Central Power & Light Co	Sayreville, N. J.	Raritan River	Burns & Roe	9-49	900	900	1	400	BW	....	....	....	23.1	ST	14.7	70.4
Kentucky Utilities Co	Tyrone, Ky.	Tyrone	Sargent & Lundy	7-48	900	900	2	150	BW	6.2	13.3	10.1	18.8	DB	0	43.4
Georgia Power Co	Harryat, Ga.	Atkinson	Commonwealth & South.	10-48	900	900	1	600	CE	....	27.5	35.5	....	DB	15.0	99.4
Bd Water & Elec Light Comm	Lansing, Mich.	Ottawa St.	Burns & Roe	2-49	900	900	3	275	BW	13.2	....	15.7	20.5	ST	42	84.3
Public Svc Co of Colorado	Denver, Colorado	Lacombe	Electric Advisors	1948	900	850	1	350	BW	13.3	16.5	17.7	26.9	ST	0	63.3
					900	850	1	150	BW	2.0	8.7	5.1	46.4	DB	0	15.2
Public Service Co of N. H.	Portsmouth, N. H.	Resistance[17]	A A Winters	11-47[18]	900	900	2	170	BW	....	....	....	....	....	....	....
Georgia Power Co	Arkwright, Ga.	Arkwright	Comm & Southern	10-48	900	860	1	400	BW	....	9.8	22.3	22.5	DB	18.1	47.7
800 PSI TO 899 PSI																
Rockland Light & Power Co	Tomkins Cove, N. Y.	Hudson	Burns & Roe	12-48	880	900	1	200	BW	7.6	17.7	16.3	16.1	DB	0.8	40.2
Braddock Light & Power Co, Inc	Alexandria, Va.	Station C	Stone & Webster	6-49	875	925	1	800	CE	29.3	20.0	56.0	16.9	DB	15.9	122.5
				6-50	875	925	1	800	CE	29.3	20.0	56.0	16.9	DB	15.9	122.5
City of Burbank	Burbank, Calif.	Burbank	C A Heinze	7-49	875	900	1	215	CE	5.9	17.1	8.8	33.8	DB	0	31.7
Virginia Electric & Power Co	Wheelwright, Va.	Chesterfield	Stone & Webster	10-49	875	900	1	650	CE	17.3	26.4	40.3	22.6	DB	0	48.9
Virginia Electric & Power Co	Possum Point, Va.	Possum Point	Stone & Webster	12-48	875	900	1	650	CE	17.5	26.4	40.3	22.6	DB	0	48.9
Connecticut Light & Power Co	Uncasville, Conn.	Montville	United Engr & Const.	3-48	850	950	1	300	CE	10.5	25.5	17.0	20.5	DB	0	82.0
				1-49	850	950	1	300	CE	10.5	25.5	17.0	20.5	DB	0	82.0
	Devon, Conn.	Devon	United Engr & Const.	5-47	850	925	2	225	CE	8.5	20.6	12.6	22.9	DB	0	40.8
Alabama Power Co	Gadsden, Ala.	Gadsden	Comm & Southern	2-49	850	900	1	600	CE	13.7	28.4	....	21.0	DB	15.0	63.0
				2-49	850	900	1	600	CE	13.7	28.4	....	21.0	DB	15.0	63.0
Mississippi Power Co	Hattiesburg, Miss.	Eaton	Comm & Southern	7-47	850	900	1	230	RS	7.4	19.6	13.4	21.4	DB	0	33.3
				8-49	850	900	1	230	RS	7.4	19.6	13.4	21.4	DB	0	33.3
Public Serv Co of Indiana	Noblesville, Ind.	Noblesville	Sargent & Lundy	6-50	850	950	3	300	RS	11.8	28.5	22.5	16.9	DB	0	117.1
Empire District Elec Co of Kan	Riverton, Kan.	Riverton	Black & Veatch	1-50	850	900	1	300	FW	11.8	18.7	23.0	16.8	DB	2.3	100.2
Kentucky Utilities Co	Green River, Ky.	Green River	Sargent & Lundy	10-49	875	910	3	215	BW	7.1	15.8	14.7	18.1	DB	3.2	50.5
Florida Power Corp	Enterprise, Fla.	Geo E Turner	J G White Engrg Corp.	2-48	860	900	1	300	BW	....	20.9	21.9	17.0	DB	0	64.5
Florida Power Corp	Inglis, Fla.	Inglis	J G White Engrg Corp.	6-47	860	900	1	300	BW	....	20.9	21.9	17	DB	0	64.5
Central Illinois Light Co	East Peoria, Ill.	R S Wallace	Comm & Southern	1-49	850	900	2	300	RS	49.3	21.0	....	18.0	DB	6.2	....
Central Illinois Pub Serv Co	Meredosia, Ill.	Meredosia	Sargent & Lundy	4-48	850	900	2	285	CE	11.6	19.2	20.2	18.0	DB	0	51.4
				10-48	850	900	2	285	CE	11.6	19.2	20.2	18.0	DB	0	51.4
Central Power and Light Co	Corpus Christi, Tex.	Nueces Bay	Sargent & Lundy	5-49	850	900	1	300	BW	7.3	64.5	....	31.5	....	0	42.4
Cons Gas, Elec Lt & Pwr Co, Balt.	Baltimore, Md.	Westport		1-50	850	900	1	610	BW	21.5	15.1	38.2	19.8	DB	13.2	66.6
Dairyland Power Cooperative	Alma, Wis.	Alma	Vern E Alden	9-47	850	825	2	190	BW	....	14.8	....	19.8	DB	0	54.8
Ohio Public Service Co	Shadyside, Ohio	R E Burger	Electric Advisors	6-50	850	950	2	500	BW	23.9	37.7	24.2	26.8	ST	0	115.5
N Y State Elec & Gas Corp	Dresden, N. Y.	Greenidge	Gilbert Assoc	4-50	850	910	2	288	BW	12.6	21.2	17.4	17.3	DB	0	57.2
Arkansas-Missouri Power Co	Campbell, Mo.	Jim Hill	Ebasco Services	9-49	850	900	1	350	CE	....	18.9	18.7	....	DB	0	52.8
Union Electric Power Co	Venice, Ill.	Venice No. 2	Stone & Webster	7-50	850	900	1	900	BW	29.2	29.0	83.8	13.7	DB	26.0	170.8
				1-51	850	900	1	900	BW	29.2	29.0	83.8	13.7	DB	26.0	170.8
Mississippi Power & Light Co	Nr Jackson, Miss.	Rex Brown	Ebasco Services	6-48	850	900	1	350	CE	9.0	14.4	18.7	26.0	....	0	52.8
New Bedford Gas & Edison Lt Co	New Bedford, Mass.	Cannon Street	Gilbert Assoc	1950	850	900	1	300	CE	10.5	31.6	22.2	16.7	DB	0	62.8
Kansas Gas & Electric Co	Wichita, Kan.	Ripley	Ebasco Services	5-50	850	900	1	350	CE	....	29.7	26.0	18.5	....	0	76.2
The Hartford Electric Light Co	Hartford, Conn.	South Meadow	Stone & Webster	1949	850	900	1	425	BW	....	18.2	38.4	14.3	DB	0	43.5
Illinois Power Company	Havana, Ill.	Havana	Sargent & Lundy	1947	850	900	3	285	CE	12.5	19.0	20.0	18.0	DB	0	47.9
Indianapolis Power & Light Co	Nr Martinsville, Ind.	White River	Gibbs & Hill	5-50	850	900	1	400	CE	14.0	26.0	23.2	22.8	ST	0	69.7
Interstate Power Company	Lansing, Ia.	Lansing	Sargent & Lundy	8-48	850	900	2	120	RS	....	13.4	8.9	17.4	DB	0	20.8
Iowa-Illinois Gas & Elec Co	Davenport, Iowa	Riverside	United Lt & Rwy Serv Co.	6-49	850	900	2	250	RS	9.5	14.5	17.5	19.8	DB	0	68.1
Iowa Public Service Co	Waterloo, Iowa	Maynard	J F Pritchard	6-50	850	900	1	200	....	5.0	17.5	10.0	25.0	....	8.0	15.0
				7-47	425	825	1	120	EM	....	11.6	6.0	29.8	....	2.3	9.0
City of Jacksonville	Jacksonville, Fla.	No. 2	Reynolds, Smith & Hills	1951	850	900	1	300	BW	....	20.6	....	24.9	....	1.9	51.1
				1951	850	900	1	300	BW	....	20.6	....	24.9	....	1.9	51.1
City of Lakeland	Lakeland, Fla.	Lakeland	Charles Larsen	9-49	850	900	1	200	BW	5.7	14.4	8.4	32.1	DB	0	23.0
Louisville Gas & Electric Co	Louisville, Ky.	Paddy's Run	Pioneer Serv & Eng Co.	10-47	850	900	1	640	FW	20.8	30.5	47.1	18.0	DB	19.0	144.0
				1-50	850	900	1	640	FW	20.8	30.5	47.1	18.0	DB	19.0	144.0
				10-50	850	900	1	640	FW	20.8	30.5	47.1	18.0	DB	19.0	144.0
Metropolitan Edison Co	Middletown, Pa.	Crawford	Gilbert Associates	12-47	850	900	2	250	FW	7.2	64.5	15.6	20.0	DB	8.6	43.0
Northern Virginia Power Co	Riverton, Va.	Riverton	Sanderson & Porter	12-49	850	900	1	350	RS	....	26.9	21.2	20.8	DB	4.0	59.0
Orlando Utilities Comm	Orlando, Fla.	Orlando	Robert & Co.	2-49	850	900	2	150	BW	5.9	12.9	9.4	21.0	....	0	....
City of Pasadena	Pasadena, Calif.	Pasadena	O H Hedrich	3-49	850	900	2	250	CE	6.1	15.3	11.5	28.6	....	0	36.7
San Diego Gas & Electric Co	San Diego, Calif.	Silver Gate	Pioneer Serv & Eng Co.	3-48	850	900	2	300	BW	8.6	21.5	12.0	35.8	....	0	44.7
Pennsylvania Electric Co	Warren, Pa.	Warren	Gilbert Assoc	7-48	850	900	4	185	EC	5.6	17.9	13.0	17.4	DB	0	31.8
Southern California Edison Co	Redondo, Calif.	Redondo	Stone & Webster	2-48	850	900	2	400	BW	14.7	7.7	13.9	....	....	5.8	62.4
				2-48	850	900	2	400	BW	14.7	7.7	13.9	....	....	5.8	62.4
South Carolina Power Co	Charleston, S. C.	Hagood	Comm & Southern	11-47	850	900	1	230	RS	7.4	11.7	13.4	21.4	....	0	31.8
Southwestern Gas & Electric Co	Longview, Texas	Knox Lee	Sargent & Lundy	3-50	850	900	1	325	BW	....	....	....	....	....	0	....
Southwestern Public Service Co	Borger, Texas	Riverview		5-48	850	900	1	330	RS	....	17.4	14.0	34.3	....	0	51.5
Staten Island Edison Corp	Travis, S. I., N. Y.	Arthur Kill	George Fries	10-47	850	900	2	120	FW	4.4	12.9	7.6	19.2	DB	0	24.6
Utah Power & Light Co	Caryhurst, Utah	Orem	Ebasco Services	6-50	850	900	1	450	RS	12.0	44.0	33.0	18.0	DB	0	68.0
Wisconsin Power & Light Co	Beloit, Wis.	Blackhawk	Sargent & Lundy	3-50	850	900	1	275	BW	9.5	18.1	21.5	15.8	DB	3.0	46.6
Minnesota Power & Light Co	Duluth, Minn.	Duluth	Ebasco Services	7-49	850	900	1	350	EC	8.8	26.7	21.5	21.0	DB	0	51.8
Dallas Power & Light Co	Dallas, Texas	Mt. Creek	Ebasco Services	3-49	850	900	1	450	BW	8.5	23.0	....	29.0	....	0	81.0
				3-49	850	900	1	250	BW	7.2	14.2	....	29.0	....	0	30.0
Dallas Power & Light Co	Dallas, Texas	Dallas	Ebasco Services	3-51	850	900	1	675	CE	....	....	....	26.0	....	0	104.7
Worcester County Electric Co	Worcester, Mass.	Webster Street	United Eng & Const.	1950	850	900	1	325	RS	11.2	33.1	20.0	19.6	DB	0	72.5
Southern Indiana Gas & Elect Co	Evansville, Ind.	Ohio River	Comm & Southern	.....	825	900	2	250	BW	7.7	22.5	15.7	22.0	DB	0	63.4
600 PSI TO 799 PSI																
Central Illinois Elect & Gas Co	Rockford, Ill.	Fordam	Stone & Webster	8-47	725	830	2	190	FW	3.9	16.1	10.4	23.3	....	9.6	18.0
Sioux City Gas & Electric Co	Sioux City, Iowa	Kirk	J F Pritchard	1-47	675	750	1	80	FW	1.4	7.9	3.3	27.0	....	4.8	3.6

A —Air cooled
AAlBr —Arsenical aluminum-brass
AAd —Arsenical admiralty
Alb —Aluminum-bronze
AlBr —Aluminum-brass
AC —Allis-Chalmers Mfg Co
Ad —Admiralty
Ads —Admiralty, stabilized
AnAd —Antimony-admiralty
AsCu —Arsenical copper
B&R —Burns and Roe
BW —Babcock & Wilcox Co
C —Coal, bituminous
C1 —Coal, anthracite
CB —Coke breeze
CE —Combustion Engineering Co
CuNi —Cupro-nickel
Cu —Copper
DL —DeLaval Steam Turbine Co
D —Damper
DB —Dry bottom
EC —Erie City Iron Works
El —Elliott Co
EM —Edge Moor Iron Works
FW —Foster Wheeler Corp
G —Natural gas
GE —General Electric Co
GT —Gas tar
H —Hydrogen cooled
Hy —Hydraulic coupling
L —Lignite
M —Motor drive
Mu —Magnetic coupling
Nl —Murray Iron Works Co
Mp —Two motors per fan
MT —Motor and turbine drive
Mu —Muntz metal
O —Oil
P —Pulverized-fuel firing
PAd —Phosphorized admiralty
Pl —Plate
R —Regulator
RB —Red brass
Re —Regenerative
RS —Riley Stoker Corp
S —Speed control
SH&G —Smith, Hinchman and Grylls
SS —Spreader stoker
ST —Slag tap
Su —Superloy
T —Turbine drive
TG —Traveling-grate stoker

and Municipal Power-Plant Installations cont'd

Furnace Bottom	Economizer Surface per Boiler, 1000 sq ft	Air-Heater Surface per Boiler, 1000 sq ft	Air-Heater Type	F-D FANS: Drive	F-D FANS: Air-Volume Control	I-D FANS: Drive	I-D FANS: Gas-Volume Control	Firing	FUEL: Type	FUEL: Heating Value, 1000 Btu per lb	FUEL: Ash-Fusion Temperature, F	FEED PUMPS: Drive	FEED PUMPS: Flow Control	TURBINES: Capacity, 1000 kw	TURBINES: Speed, rpm	TURBINES: Manufacturer	TURBINES: Back pressure, psia	TURBINES: No. of Bleed Points	Generator Cooling	CONDENSERS: Surface, 1000 sq ft	CONDENSERS: No. Water Passes	CONDENSERS: Tube Material	Total Boiler Capacity Incl New Units, 1000 lb	Total Generator Capacity Incl New Units, 1000 kw
....	13.7	67.0	Tu	M	V	M	D	G	G	1018[13]	....	3M, 1T	....	60	3600	WE	1.75	4	H	60	2	AsCu	675	66
....	13.7	67.0	Tu	M	V	M	D	G	G	1018[13]	....	3M, 1T	....	60	3600	WE	1.75	4	H	60	2	AsCu	1350	135
ST	14.7	70.4	Tu	M	D, V	M	Ma	P	C	14.0	2550	3M	Hy	25	3600	GE	300	0	H	....	..	.....	1560	105
DB	0	43.4	Pl	M	D	M	Hy	P	C	12.0	2300	1M	R	25	3600	WE	0.5	4	H	25	2	Mu	600	50
DB	15.0	99.4	Re	....	....	....	....	P	C&G	13.1	....	.....	....	60	3600	GE	1.0	4	H	....	..	.....	2700	240
ST	42	84.3	Tu	M	Hy	M	Hy	P	C	13.0	2400	4M	R	25[14]	3600	AC	0.5	6	H	23.5	2	Ad	1275	75
ST	0	63.3	Tu	M	V	M	V	P, G, O	L, G, O	9.6	2100	2M, 1MT	R	35	3600	GE	0.6	7	H	25.0	2	PAd	615	47.5
DB	0	15.2	Tu	M	V	M	V	G, O	G, O	850[13]	....													
....	....	....	..	....	....	....	....	O	O	....	....	.....	....	30	3600	GE	.75	4	A	....	..	.....	340	30
DB	18.1	47.7	Re	M	V	M	S	P, G	C, G	13.1	2200	2M	S	43.8	3600	GE	1.0	4	H	31.3	2	Ad	1600	175
DB	0.8	40.7	Tu	M	D	M	Hy	P	C	13.4	2050	2M	....	22	3600	GE	0.5	4	H	17.5	1	Ad	200	22
DB	15.9	122.5	Tu	M	V	M	Ma	P	C	13.5	2450	3M	R	80	1800	GE	0.5	5	H	75	2	Ad	800	80
DB	15.9	122.5	Tu	M	V	M	Ma	P	C	13.5	2450	3M	R	80	1800	GE	0.5	5	H	75	2	Ad	1600	160
DB	0	31.7	Re	M	S, V	M	D, V	G, O	G, O	1100[13]	....	2M	R	20	3600	AC	.75	4	H	18	2	AnAd	585	40
DB	0	48.9	Re	M[19]	D, V	M[19]	D, V	P	C	13.6	2400	3M, 1T	S	60	3600	GE	.75	4	H	45	1	AAd	1175	110
DB	0	48.9	Re	M	D, V	M	D, V	P	C	13.6	2360	3M, 1T	S	60	3600	GE	0.75	4	H	50	2	AAd	650	60
DB	0	82.0	Re	M	V	M	Hy	P	C	12.5	2400	2M	R	31.25	3600	GE	0.5	5	H	24	2	AlBr	690	70
DB	0	82.0	Re	M	V	M	Hy	P	C	12.5	2400	2M	R	31.25	3600	GE	0.5	5	H	24	2	AlBr	990	101
DB	0	40.8	Re	M	V	M	Hy	P	C	12.5	2400	2M	R	45	3600	WE	0.5	5	H	30	1	AlBr	2025	165
DB	15.0	63.0	Re	M	Hy	M	Hy	P	C	12.0	2750	2M	R	60	3600	GE	1.0	4	H	47.0	2	Ad	600	60
DB	15.0	63.0	Re	M	Hy	M	Hy	P	C	12.0	2750	2M	R	60	3600	WE	1.0	4	H	47.0	2	Ad	1200	120
DB	0	33.3	Tu	Mp	V	Mp	V	G, O	G, O	1000[13]	....	2M	R	22.5	3600	GE	1.0	3	H	20.3	2	Ad	460	45
DB	0	33.3	Tu	Mp	V	Mp	V	G, O	G, O	1000[13]	....	2M	R	22.5	3600	WE	1.0	3	H	20.3	2	Ad	690	67.5
DB	0	117.1	Re	M	V	M	V	P	C	11.0	2100	3M, 1T	R	40[14]	3600	WE	0.75	4	H	40	2	AAd	900	80
DB	2.3	100.2	Re	2M	V	2M	D, Hy	P, O, G	C, O, G	11.8	2040	1M, 1T	R	30.0	3600	WE	.56	4	H	32.5	2	Ad	1325	100
DB	3.2	50.5	Pl	M	D	M	Hy	P	C	11.0	2200	2M, 1T	R	30.0[14]	3600	WE	.....	4	H	27.5	2	.....	645	60
DB	0	64.5	Tu	M	V	M	S	O	O	18.4	....	3M	R	25.0	3600	WE	1.0	4	H	25.0	1	Ad	450	37.5
DB	0	64.5	Tu	M	V	M	D	O	O	18.4	....	3M	R	25	3600	GE	1.0	4	H	23.0	1	.....	700	50
DB	6.2	.....	Tu	M	Hy	M	Hy	P	C	9.8	1900	2M	....	35	3600	WE	0.5	4	H	....	2	PAd	1790	141.4
DB	0	51.4	Tu	M	Ma	M	Ma	P	C	9.8	2000	1M, 1T	R	50	3600	GE	0.5	4	H	45	1	AsCu[20]	1570	50
DB	0	51.4	Tu	M	Ma	M	Ma	P	C	9.8	2000	2M	R	50	3600	GE	0.5	4	H	45	1	AsCu[20]	1140	100
....	0	42.4	Tu	M	V	M	V	G	G	1050[13]	....	1M, 1T	R	30	3600	WE	.75	4	H	27.5	2	AAlBr	....	75
DB	13.2	66.6	Re	M	V	M	S, D	P	C	12.9	2376	1M	S	60	3600	GE	0.5	5	H	55	2	AAlBr	3936	307.5
DB	0	54.8	Tu	M	Hy	M	Hy	P	C	11.0	2100	3M	R	30	3600	GE	0.5	4	H	12	2	.....	380	30
ST	0	115.5	Tu	Mp	V	Mp	V	P	C	12.4	1900	4MT	R	100	3600	WE	0.75	6	H	70.0	2	.....	2400	230
DB	0	57.2	Re	M	V	Mp	V	P	C	13.2	2000	1M, 1T, 1MT	S	40	3600	GE	0.5	4	H	32.5	2	Ads	680	80
DB	0	52.8	Tu	....	....	....	....	G, O	G, O	....	....	.....	....	30	3600	GE	.....	3	..	....	..	.....	350	30
DB	26.0	170.8	Re	M	Hy	M	Hy	P	C	11.0	1900	2M	R	80	1800	GE	0.7	4	H	75.0	2	Ad	3080	320
DB	26.0	170.8	Re	M	Hy	M	Hy	P	C	11.0	1900	2M	R	80	3600	WE	0.7	4	H	75.0	2	Ad	3980	400
....	0	52.8	Tu	M	D	M	D, V	G	G	1000[13]	....	2M, 1T	R	30	3600	GE	1.12	4	H	27.5	2	.....	350	30
DB	0	62.8	Tu	M	V	M	V	P	C, O	12.4[30]	1900	1M, 1MT	R	30	3600	WE	0.75	5	H	25.0	2	AlBr	1723	137.5
....	0	76.2	Re	M	D, V	M	D	G, O	G, O	1013[13]	....	2M	....	30	3600	WE	0.75	4	H	30.0	2	AsCu	990	78
DB	0	43.5	Re	M	D, Hy	M	D, Hy	P	C, O	12.6	2150	2M, 1T	R	45	3600	GE	0.75	3	H	36.0	2	Ad	2300	230
DB	0	47.9	Tu	M	D, Hy	M	D, Hy	P	C	10.5	1900	3M, 1T	R	40[14]	3600	GE	0.5	4	H	30.0	1	AsCu	855	80
ST	0	69.7	Re	M	V	M	V	P	C	11.0	1970	2M, 1MT	R	40	3600	GE	0.75	5	H	30.0	2	AAd	800	80
DB	0	20.8	Tu	M	V	M	Hy	P	C	10.5	2050	1M, 1T	R	15	3600	AC	0.5	4	H	15.0	2	PAd	240	15
DB	0	68.1	Re	M	V	M	Hy	P, G	C, O, G	10.0	1930	2M	....	40	3600	GE	0.75	5	H	37.5	2	PAd	1660	109.7
														5	3600	WE	0.75	1	A	5.5	2	PAd	1660	114.7
....	8.0	15.0	Tu	M	D, V	M	D	SS(425)	C	10.5	1900	1M, 1T	S, R	20	3600	GE	0.75	4	H	18.0	2	Ad	715	60
....	2.3	9.0	Tu	M	D, V	M	D	SS(291)	C	10.5	1900	1M, 1T	S, R	10	3600	GE	0.75	4	A	10	1	Ad	515	40
....	1.9	51.1	Tu	Mp	V	Mp	D	O	O	18.4	....	2M	R	30	3600	WE	0.75	4	H	27.5	1	AlBr	300	30
....	1.9	51.1	Tu	Mp	V	Mp	D	O	O	18.4	....	2M	R	30	3600	WE	0.75	4	H	27.5	1	AlBr	600	60
DB	0	23.0	Tu	M	V	M	V	O	O	18.6	....	2M, 1T	R	20	3600	AC	1.0	4	H	32.5	2	Ad	330	35
DB	19.0	144.0	Re	M	Ma	M	Ma	P	C	10.2	1900	3M	....	60	3600	WE	0.75	5	H	55.6	2	Ad	1165	120
DB	19.0	144.0	Re	M	Ma	M	Ma	P	C	10.2	1900	3M	....	60	3600	GE	0.75	5	H	55.0	2	Ad	1905	180
DB	19.0	144.0	Re	M	Ma	M	Ma	P	C	10.2	1900	3M	....	60	3600	WE	0.75	5	H	55.0	2	Ad	2545	240
DB	8.6	43.0	Re	M	V	Mp	V	P	C	13.0	2100	2M, 1MT	R	35	3600	GE	0.5	4	H	34.0	2	Ad	....	.....
														3	3600	GE	350	..	A	....	..	.....	....	115.5
DB	4.0	59.0	Tu	M	V	M	D	P	C	13.0[9]	2000	2M	R	30	3600	GE	0.75	4	H	27.5	2	Ad	350	30
....	0	.....	Re	M	V	M	V	O	O	18.5	....	2M, 1T	R	25	3600	GE	1.0	4	H	30.0	2	Ad	585	43
....	0	36.7	Re	Mp	V	Mp	V	G, O	G, O	1100[13]	....	3M	R	35	3600	AC	1.0	4	H	25.0	2	AsCu	1300	75
....	0	44.7	Tu	M	V	M	D, Hy	G, O	G, O	1066[13]	....	3M	R	50	3600	GE	0.75	4	H	40.7	2	AlBr	1000	85
DB	0	31.8	Tu	M	V	Mp	V	P	C	12.3	2600	2M, 1MT	R	35	3600	WE	0.5	4	H	30.0	2	Ad	750	70
....	5.8	62.4	Re	M	D, V	M	D, V	G, O	G, O	18.5	....	3M, 1T	R	60	3600	WE	0.75	4	H	42.5	2	AlBr	800	60
....	5.8	62.4	Re	M	D, V	M	D, V	G, O	G, O	18.5	....	3M	R	60	3600	GE	0.75	4	H	42.5	2	AlBr	1600	120
....	0	31.8	Tu	Mp	V	Mp	V	O	O	.....	....	2M	R	22.5	3600	GE	1.0	3	H	20.4	2	.....	230	22.5
....	0	.....	Tu	M	V	M	V	G	G	1000[13]	....	1M, 1T	R	33	3600	WE	1.0	4	H	25.0	1	.....	325	33
....	0	51.5	Tu	Mp	D, V	Mp	D, V	G	G	935[13]	....	2M, 1T	....	30	3600	WE	1.25	4	H	32.5	2	AAd	865	69
....	0	24.6	Tu	M	V	Mp	V	P	C	13.5	2600	1M, 1MT	R	25	3600	WE	0.5	4	H	18.9	2	AlBr	240	25.5
....	0	68.0	Tu	M	V	M	V	P	C	12.9	1950	2M, 1T	R	40	3600	WE	0.75	4	H	35.0	2	AnAd	650	59
....	3.0	46.6	Tu	M	V	M	V	P	C	11.5	....	1M	R	25	3600	GE	0.5	4	H	25.0	2	.....	550	50
....	0	51.8	Tu	M	D	M	D	P	C	13.4	....	1M, 1T	R	30	3600	GE	1.0	5	H	20.0	1	Ad	975	83
....	0	81.0	Re	M	V	M	V	G	G	1000[13]	....	1M	R	60	3600	GE	1.5	3	H	50.0	1	AsCu	1400	116.25
....	0	30.0	Pl	M	V	M	V	G	G	1000[13]	....	1T	R											
....	0	104.7	Tu	M	V	M	V	G	G, O	1000[13]	....	2M	R	60	3600	WE	1.5	3	H	....	1	Cu	1945	142.5
....	0	72.5	Tu	....	....	....	....	P	C	.....	....	.....	....	30	3600	WE	0.75	5	H	....	..	.....	....	78.0
....	0	63.4	Tu	Mp	V	Mp	D	P	C	10.0	2000	1M	R	20	3600	AC	0.5	0	H	18.3	2	Ad	1510	92.5
....	9.6	18.0	Tu	M	D	M	Ma	SS(426.2)	C	10.6	1950	2M, 1T	....	20[14]	3600	AC	0.75	3	A	17.4	2	Ad	1055	73
....	4.8	3.6	Tu	M	V	M	S, D	SS(166)	C, O, G	11.8	2070	1M	....	7.5	3600	WE	1.0	3	A	7.6	2	PAd	300	16

Tu —Tubular
UF —Underfeed stoker
UI —Union Iron Works
V —Vane control
Vo —Henry Vogt Machine Co
Wi —Wickes Boiler Co
WE —Westinghouse Electric Corp
Wo —Worthington Pump & Mach Corp
(123) —Stoker grate area, sq ft

1—Reheat to 1000 F
2—Reheater surface, 30,200 sq ft
3—2 fans per boiler
4—12,000 to 14,000 Btu per lb
5—2000 to 2900 F
6—Bleed at 400 psia
7—1 motor, 1 turbine, 2 fans, 1 shaft
8—One bleed point for induction steam
9—12,000 to 13,900 Btu per lb
10—Gas, 1015 Btu per cu ft
11—Reheater surface, 9500 sq ft
12—60,000-kw rating, 75,000-kw max
13—Btu per cu ft
14—2 turbines being installed
15—Extraction at 200 psig for industrial sales
16—600,000 lb per hr with 12,640-Btu subnormal coal
17—Floating power plant
18—Bought in 1946, built in 1943
19—2 units of 1 motor driving one i-d, one f-d fan
20—Cupro-nickel in top rows of condenser
21—Gas-fired, 30,350 Btu on oil
22—An i-d and f-d fan driven by one motor
23—Gas-fired, 29,800 Btu on oil
24—Reheat to 835 F
25—Radiant reheater, 2964 sq ft
26—Reheat to 900 F
27—Radiant reheater, 3414 sq ft
28—12,330 to 14,400 Btu per lb
29—2045 to 2800 F
30—12,416 to 14,066 Btu per lb
31—Coke breeze; gas tar 165,000 Btu per gal
32—Started operation Jan 1948
33—H-p element 3600 rpm, l-p element 1800 rpm
34—See also 1949 unit at 650 psi

1948 Listing of Typical Central-Station and

For Notes on Uses and Limitations of this Tabulation • See page 122

Compiled by B G A Skrotzki, Associate Editor

Company	Location	Plant Name	Consulting Engineers	First Operation, New Units	Nominal Pressure, psi	Nominal Steam Temperature, F	BOILERS: Number	BOILERS: Capacity, Each 1000 lb per hr	BOILERS: Manufacturer	BOILERS: Superheater Surface, 1000 sq ft	BOILERS: Boiler, Waterwall Surface, 1000 sq ft	Furnace Volume, 1000 cu ft	Heat release, 1000 Btu per cu ft per hr	Furnace Bottom
Consolidated Edison Co of N Y	Bronx, N. Y.	Hunts Point		9-48	650	750	2	150	CE	4.0	17.9	13.1	16.8	....
Gulf States Utilities Co	Baton Rouge, La.	Louisiana	Stone & Webster	5-49	650	750	1	500	CE	4.7	35.0	37.3	16.7	....
New York State Elec & Gas Corp	Bainbridge, N. Y.	Jennison	Gilbert Assoc	10-50	650	910	2	200	CE	8.1	22.9	9.7	27.2	....
Oklahoma Gas & Electric Co	Ponca City, Okla.	Beerbower	Pioneer Serv & Eng Co	7-48	650	900	1	250	FW	9.9	17.4	17.0	18.9	DB
Eastern Shore Pub Serv of Md	Vienna, Md.	Vienna	United Eng & Const	2-48	650	825	1	160	BW	....	....	9.6	21.3	DB
				1-49	650	825	1	160	BW	....	....	9.6	21.3	DB
Kansas Gas & Electric Co	Wichita, Kan.	Ripley	Ebasco Services	8-48	650	825	2	160	CE	3.5	10.9	6.1	34.0	....
Missouri Utilities Company	Oran, Mo.	Harry Newman	J F Pritchard	8-49	650	825	1	90	CE	....	12.1	....	....	....
Northwestern Public Service Co	Mitchell, S. D.	Mitchell	Sargent & Lundy	10-48	650	825	2	50	RS	2.3	7.7	2.4	28.7	....
				7-50	650	825	2	80	....	....	....	....	....	....
Public Service Co of Oklahoma	Weleetka, Okla.	Weleetka	Sargent & Lundy	1950	650	835	1	300	BW	....	24.2	....	....	....
Southwestern Public Serv Co	Abernathy, Texas	Tuco		9-49	650	825	1	275	BW	5.3	18.7	11.2	32.0	....
Southwestern Public Serv Co	Amarillo, Texas	East		5-51	650	825	1	380	BW	....	33.2	17.6	27.8	....
Southwestern Public Serv Co	Carlsbad, N. M.	Carlsbad		9-48	650	825	2	80	BW	....	7.7	3.3	32.0	....
Texas Electric Service Co	Monahans, Texas	Permian Basin	Ebasco Services	1948	650	800	2	150	CE	3.2	12.0	....	33.1	....
				1949	650	800	2	150	CE	3.2	12.0	....	33.1	....
Texas Electric Service Co	Wichita Falls, Texas	Wichita Falls	Ebasco Services	....	650	800	1	150	CE	3.2	12.0	6.1	33.1	....
Kansas City Power & Light Co	Kansas City, Mo.	Grand Avenue	United Lt & Rwy Serv	9-48	636	950	1	375	CE	9.9	21.4	21.2	23.1	ST
Iowa Public Service Co	Eagle Grove, Iowa		J F Pritchard	4-49	635	835	1	100	BW	....	....	4.8	27.0	....
Iowa Public Service Co	Storm Lake, Iowa	Hawkeye	J F Pritchard	4-49	635	835	1	100	BW	....	....	4.8	27.0	....
Central Louisiana Electric Co	St Landry, La.	Coughlin	Sargent & Lundy	6-48	625	825	2	90	BW	2.1	18.4	4.3	28.0	....
Glendale Public Service Dept	Glendale, Calif.	Glendale	Carl Heinze	10-47	625	825	1	200	CE	2.5	15.0	7.8	33.5	....
Public Service Co of New Mexico	Albuquerque, N. M.	Albuquerque	Stearns, Roger	11-48	600	825	1	125	BW	2.2	11.7	5.0	....	....
				8-47	400	750	2	35	BW	0.8	4.9	0.5	....	....
City of Lubbock	Lubbock, Texas	Lubbock	Truman Green	7-49	600	825	1	100	UI	....	11.0	3.9	25.0	....
Missouri Power & Light Co	Mexico, Mo.	Mexico	Black & Veatch	1949	600	825	1	90	CE	....	12.0	....	....	....
West Texas Utilities Co	Abilene, Texas	Abilene	Sargent & Lundy	7-48	600	825	1	100	BW	2.1	8.3	4.3	31.0	....
Menasha Elec & Water Util	Menasha, Wis.		Laramore & Douglass	2-49	600	750	2	60	Wi	....	8.2	2.9	....	....
599 PSI AND BELOW														
El Paso Electric Co	El Paso, Texas	Rio Grande	Stone & Webster	5-49	450	750	1	185	BW	4.2	12.0	8.5	29.8	....
Provo City	Provo, Utah	Provo City	Burns & McDonnell	12-48	450	750	1	125	RS	2.0	11.2	....	....	....
City of Crawfordsville	Crawfordsville, Ind.	Crawfordsville	Comm Testing & Engrg Co	12-48	450	750	1	90	BW	....	9.6	3.3	....	....
Montana-Dakota Utilities Co	Acme, Wyo.	Acme		2-48	450	750	1	45	BW	1.5	5.6	5.4	....	....
Public Utilities Commission	New Ulm, Minn.		J T Rynda, Jr.	5-48	450	750	1	80	....	2.5	10.7	3.6	....	....
				12-48	450	750	1	80	....	2.5	10.6	3.0	....	....
Village of Winnetka	Winnetka, Ill.	Winnetka	Sargent & Lundy	10-48	435	750	1	60	BW	3.3	14.0	2.3	35.2	....
Florida Power & Light Co	Lake Monroe, Fla.	Sanford	Ebasco Services	12-47	425	750	1	125	CE	2.5	12.5	5.8	27.3	....
Dept of Utilities	Fremont, Nebr.		Lutz & May	1949	460	825	1	75	....	....	....	....	....	....
Southwestern Public Service Co	Denver City, Texas	Denver City		3-48	450	750	2	150	CE	2.1	12.9	6.5	34.4	....
City of Rocky Mount	Rocky Mount, N. C.		W C Olsen	1948	450	750	1	150	BW	....	17.0	....	....	DB
Board of Public Works	Poplar Bluff, Mo.		Rogers Schmidt	4-48	450	750	1	40	Vo	....	5.7	1.8	....	....
Southwestern Electric Service Co	Jacksonville, Texas	Jacksonville	D C Pfeiffer	7-48	450	750	1	60	BW	....	6.2	5.0	....	....
Water & Electric Dept	McPherson, Kan.	McPherson		6-48	450	750	1	100	RS	1.5	10.6	5.2	25.0	....
City of Fairbury	Fairbury, Nebr.		Black & Veatch	12-48	450	750	1	60	EM	1.5	7.6	....	....	DB
Greenwood Elec Lt & Water	Greenwood, Miss.			9-48	450	750	1	110	BW	....	11.3	....	....	DB
Town of Wilson	Wilson, N. C.		W C Olsen	4-48	450	725	1	100	BW	1.4	9.8	....	....	DB
City of Thomasville	Thomasville, Ga.	Thomasville		6-47	450	725	1	50	BW	....	6.4	2.4	27.0	DB
City of Hagerstown	Hagerstown, Md.		A C Wood & Assoc	7-49	450	715	2	70	EC	....	6.0	2.8	....	....
City of Hastings	Hastings, Nebr.		Black & Veatch	1948	425	825	1	70	BW	2.7	6.6	5.0	....	....
Greenwood County Elec Pwr Comm	Chappells, S. C.	Buzzards Roost	G Hill	8-48	425	725	1	130	BW	....	10.4	....	19.6	DB
Manitowoc Public Utilities	Manitowoc, Wis.			4-48	425	700	1	120	Wi	14.2	17.0	5.6	29.3	....
Water & Light Dept	Virginia, Minn.		Laramore & Douglass	11-48	425	700	2	60	EM	1.1	8.5	2.7	....	....
Borough of Vineland	Vineland, N. J.		H A Kuljian	1948	420	750	1	105	BW	3.6	9.3	4.2	24.8	....
Public Service Dept	Moorehead, Minn.		Helmick, Edeskuty, Lutz	8-47	420	750	1	55	BW	....	6.7	2.8	11.3	....
City of Kansas City	Kansas City, Kan.	Quindaro	Burns & McDonnell	4-48	410	750	1	200	BW	....	19.8	16.2	20.5	ST
Municipal Light & Water	Clay Center, Kan.		A C Kirkwood	12-48	400	750	1	40	....	....	....	....	....	....
City of Willmar	Willmar, Minn.	Willmar	Pfeifer & Shultz	11-48	400	750	1	55	BW	....	....	4	....	....
Municipal Utilities	Sleepy Eye, Minn.		Pfeifer & Shultz	5-48	400	750	1	40	BW	2.5	6.6	2.4	25.0	....
Mt. Carmel Public Utility	Mt. Carmel, Ill.	Mt. Carmel		10-47	400	750	1	60	Vo	....	1.1	....	....	....
City of Gainesville	Gainesville, Fla.		Robert & Co.		400	750	1	65	BW	....	7.3	3.5	26.2	....
City of Carlyle	Carlyle, Ill.			1949	400	750	1	37	EC	....	7.1	1.9	29.0	....
Austin, Minn.	Austin, Minn.		Edeskuty	5-48	400	750	....	....	....	....	....	....	....	....
Atlantic, Iowa	Atlantic, Iowa		Stanley Eng Co	6-49	400	750	1	55	MI	1.0	5.9	....	36.6	....
Board of Public Works	Alexandria, Minn.		Pfeifer & Shultz	8-48	400	750	1	50	BW	....	....	....	....	....
City Light & Water Utilities	Kalamazoo, Mich.		Hubbard Eng Co	12-49	400	750	1[32]	40	Wi	....	4.5	2.0	....	....
Missouri Public Service Corp	Clinton, Mo.	Clinton	Burns & McDonnell	5-48	400	750	1	110	BW	....	12.4	4.8	33.4	....
Missouri Public Service Corp	Sedalia, Mo.	Sedalia	Burns & McDonnell	5-49	400	750	1	100	....	....	....	....	....	....
Otter Tail Power Co	Devils Lake, N. D.	Devils Lake		11-47	400	750	1	75	RS	....	10.0	3.4	32.5	....
The Western Colorado Power Co	Durango, Colo.	Durango		10-48	400	750	1	57	UI	....	5.5	4.3	17.5	DB
City of Frankfort	Frankfort, Ind.		Emery, Marker & Emery	49-50	400	725	2	110	BW	....	13.5	5.0	28.5	....
City Water & Light	Jonesboro, Ark.		N B Thayer	1-49	400	700	2	55	BW	....	....	....	....	....
Sioux City Gas & Elec Co	Sioux City, Iowa	Big Sioux	J F Pritchard	10-48	360	750	....	....	....	....	....	....	....	....
Consolidated Edison Co of N. Y.	Long Island City, N. Y.	Ravenswood	J G White Eng Corp	1-47	325	Sat	3	275	BW	0	35.7	17.1	20.2	....
Consolidated Edison Co of N. Y.	Manhattan, N. Y. C.	65th Street	Baker & Spencer	2-48	325	Sat	1	275	BW	0	3.1	17.1	22.1	....
Southwestern Gas & Elec Co	Karnack, Texas	Karnack	Sargent & Lundy	6-48	200	385	4	100	CE	....	....	....	....	....
Pacific Power & Light Co	Portland, Ore.	Pittock	Ebasco Services	1-48	185	525	1	150	BW	0.6	13.5	6.4	32.5	....
City of Escanaba	Escanaba, Mich.	Steam Heating	Laramore & Douglass	12-47	175	550	1	35	Wi	0.5	6.0	1.9	....	....
Westchester Lighting Co	Pelham Manor, N. Y.	Pelham		12-47	175	Sat	1	59	BW	0	7.1	1.9	32.0	....

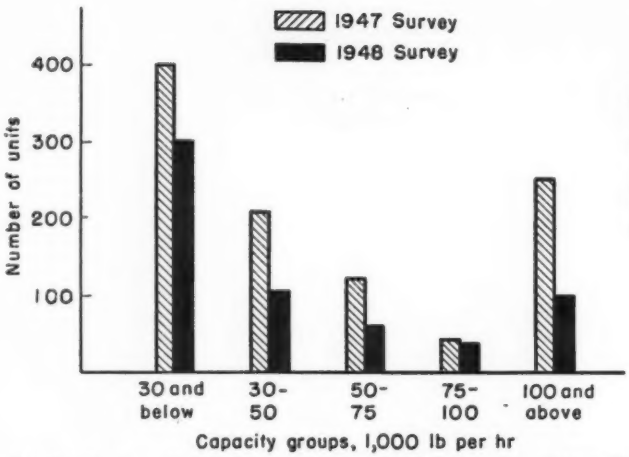
A —Air cooled
AAlBr—Arsenical aluminum-brass
AAd —Arsenical admiralty
AlB —Aluminum-bronze
AlBr —Aluminum-brass
AC —Allis-Chalmers Mfg Co
Ad —Admiralty
Ads —Admiralty, stabilized
AnAd —Antimony-admiralty
AsCu —Arsenical copper
B&R —Burns and Roe
BW —Babcock & Wilcox Co
C —Coal, bituminous
CA —Coal, anthracite
CB —Coke breeze
CE —Combustion Engineering Co
CuNi —Cupro-nickel
Cu —Copper
DL —DeLaval Steam Turbine Co
D —Damper
DB —Dry bottom
EC —Erie City Iron Works
El —Elliott Co
EM —Edge Moor Iron Works
FW —Foster Wheeler Corp
G —Natural gas
GE —General Electric Co
GT —Gas tar
H —Hydrogen cooled
Hy —Hydraulic coupling
L —Lignite
M —Motor drive
Ma —Magnetic coupling
MI —Murray Iron Works Co
Mp —Two motors per fan
MT —Motor and turbine drive
Mu —Muntz metal
O —Oil
P —Pulverized-fuel firing
PAd —Phosphorized admiralty
Pl —Plate
R —Regulator
RB —Red brass
Re —Regenerative
RS —Riley Stoker Corp
S —Speed control
SH&G—Smith, Hinchman and Grylls
SS —Spreader stoker
ST —Slag tap
Su —Superloy
T —Turbine drive
TG —Traveling-grate stoker

and Municipal Power-Plant Installations cont'd

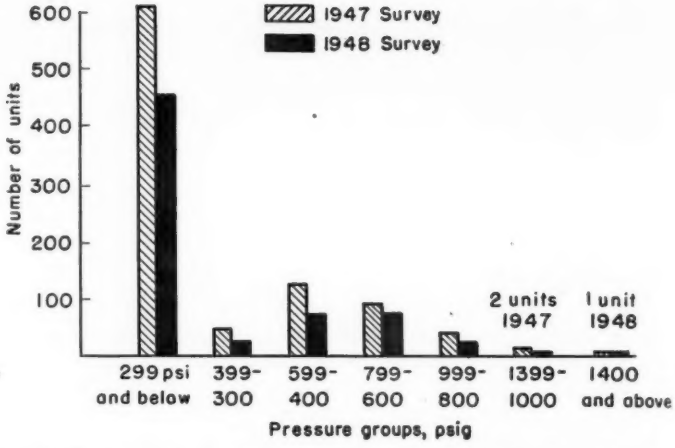
Economizer Surface per Boiler, 1000 sq ft	Air-Heater Surface, per Boiler, 1000 sq ft	Air-Heater Type	F-D FANS		I-D FANS		Firing	FUEL			FEED PUMPS		TURBINES					Generator Cooling	CONDENSERS			Total Boiler Capacity Incl New Units, 1000 lb	Total Generator Capacity Incl New Units, 1000 kw
			Drive	Air-Volume Control	Drive	Gas-Volume Control		Type	Heating Value, 1000 Btu per lb	Ash-Fusion Temperature, F	Drive	Flow Control	Capacity, 1000 kw	Speed, rpm	Manufacturer	Back pressure, psia	No. of Bleed Points		Surface, 1000 sq ft	No. Water Passes	Tube Material		
9.8	0	...	M	V	M	V	TG(561)	CB, GT	12,274[31]	2576	3T	R	7.5	3600	WE	200	0	A	....	..	.....	604	7.5
0	91.8	Re	T	S	T	S	O, G	O, G	1000[13]	....	1T	S	.....	.....	...	...	...	...	...	...	.....	3550	108.5
10.3	12.0	Tu	M	Ma	M	Ma	TG(672)	CA	11.4	2900	1M,1T,1MT	R	30	3600	GE	0.75	4	H	23.0	2	Ads	800	60
6.0	48.8	Re	M	Hy	M	Hy	P	C	11.5	1950	3M	S	25	3600	WE	0.75	3	H	18.0	2	.....	550	42
0	27.0	Re	M	V	Mp	D	P	C	13.3	2100	3M	R	15	3600	WE	0.75	5	A	14.0	2	Ad	500	42
0	27.0	Re	M	V	Mp	D	P	C	13.3	2100	3M	R	15	3600	WE	0.75	5	A	14.0	2	Ad	660	57
0	18.9	Re	M	D	M	D	O, G	O, G	1013[13]	....	2M	....	25	3600	WE	0.87	3	H	30	2	AsCu	640	48
3.7	5.4	Tu	M	V	M	Hy	SS(244)	C	12.0	2230	1M, 1T	R	7.5	3600	WE	1.25	3	A	8.5	2	Ad	90	7.5
0.4	4.5	Tu	M	D	M	D	TG(180)	L	7.0	2200	1M, 1T	S	7.5	3600	AC	1.0	3	A	7.5	2	.....	225	15
...	.....	...	...	.....	...	.....	.....	L	.....	....	.....	...	11.5	3600	...	1.0	4	A	10.0	2	.....	325	26
0	63.0	Tu	M	V	M	Hy	O, G	O, G	.....	....	1M, 1T	R	30	3600	WE	1.25	4	H	32.5	2	.....	900	80
...	.....	Re	M	V	M	D	O, G	O, G	1000[13]	....	2M, 1T	....	25	3600	GE	1.0	4	H	22.5	2	AAd	530	40
0	13.6	Re	M	D, V	M	D	O, G	O, G	1000[13]	....	3M	....	37.5	3600	GE	1.0	4	H	37.5	2	AAd	955	72.5
0	.....	Re	M	V	M	D	O, G	O, G	1000[13]	....	2M, 1T	....	15	3600	AC	1.0	4	H	20.0	2	AAd	280	25.0
0	20.3	Re	M	D	M	V	G	G	1050[13]	....	2M, 1T	R	12.5[14]	3600	El	1.75	4	A	11.0	2	AsCu	300	25
0	20.3	Re	M	D	M	V	G	G	1050[13]	....	2M, 1T	R	12.5[14]	3600	El	1.75	4	A	11.0	2	AsCu	600	50
0	20.3	Re	M	V	M	V	G	G	1050[13]	....	1M, 1T	R	12.5	3600	El	1.75	4	A	11.0	2	.....	376.4	23.4
0	115.0	Re	MT	V	MT	Hy	P	C, G	10.3	1900	1M	R	35	3600	WE	0.75	6	H	32.5	1	AsCu	1835	146.5
2.8	9.0	Tu	M	V	M	Hy	SS(246)	C, G	10.4	1990	1M, 1T	....	7.5	3600	GE	1.0	3	A	9.5	2	Ad	100	7.5
2.8	9.0	Tu	M	V	M	Hy	SS(246)	C	10.4	1990	1M, 1T	....	7.5	3600	GE	1.0	3	A	9.5	2	Ad	100	7.5
0	10.1	Tu	M	D	M	D	G	G	1100[13]	....	2M, 1T	R	7.5[14]	3600	GE	0.75	3	A	8.0	2	Ad	180	15
0	19.6	Re	Mp	V	Mp	V	O	O	18.5	....	1M	R	20	3600	GE	1.0	4	H	16.0	2	Cu	600	40
0	16.2	Tu	M	V	M	D	G, O	G, O	1060[13]	....	2M	R	11.5	3600	GE	0.75	2	A	12.0	2	.....	465	38
0	2.5	Tu	M	V	.....	.....	G, O	G, O	1060[13]	....	1	R	6	3600	GE	0.75	2	A	7.9	2	.....	340	26
0	11.0	Pl	M	V	M	V	G, O	G, O	1000[13]	....	2M	R	7.5	3600	DL	1.0	3	A	11.0	2	Ad	100	19
3.7	5.4	Tu	M	V	Mp	S, D	SS(244)	C	9.5	....	1MT	R	7.5	3600	AC	0.75	3	A	11.0	2	Ad	90	7.5
0	10.3	Tu	M	V	M	V	G, O	G, O	1050[13]	....	1M, 1T	R	7.5	3600	El	1.0	3	A	8.0	2	Ad	260	12.5
0	3.6	Tu	M	D	M	D	SS(132)	C	11.5	....	1M, 1T	R	4.4[14]	3600	Wo	1.0	3	A	4.0	2	Ad	120	10
0	34.0	Re	M	D, V	Mp	S, V	G, O	G, O	1100[13]	....	2M, 1T	....	20.0	3600	GE	0.75	4	H	19.0	1	Ad	740	69
0	.....	Tu	M	V	M	V	SS(272)	C, O	12.0	2000	2M	R	9.4	3600	El	0.75	3	A	9.0	2	CuNi	205	14
5.5	0	...	MT	.....	MT	S, V	TG(224)	C	11.3	2100	2M, 1T	S, R	7.5	3600	WE	1.0	3	A	10.0	2	Ad	205	18
0	.....	Tu	Mp	D	Mp	D	SS(160)	C	8.9	....	1M, 1T	....	3	3600	WE	0.6	2	A	3.5	2	.....	121	7.0
0	5.0	Tu	M	Hy	M	Hy	SS(195)	C, O, G	11.5	....	2M, 1T	R	.....	....	...	...	..	..	...	..	.....	....	.....
...	.....	Tu	M	Hy	M	Hy	SS(150)	C	12.0	2400	1M, 1T	R	.....	....	...	...	..	..	...	..	.....	....	.....
0.9	5.2	Tu	M	D	M	D	TG(207)	C	11.6	2200	2M, 1T	R	5	3600	WE	0.5	3	A	6.0	2	AsCu	140	10.5
0	11.0	Tu	M	V	M	D	O	O	18.3	....	3M, 1T	S	15	3600	WE	1.12	3	H	15.0	1	Ad	325	27
....	5	...	...	.....	...	.....	.....	G, C	12.5	2200	1M	R	10	3600	GE	1.0	4	A	10.0	3	Ad	295	21
0	0	...	M	D	M	S	G, O	G, O	1255[13]	....	1M, 1T	R	20	3600	GE	1.0	3	H	20.0	2	AAd	600	37.5
0	19.2	Tu	MT	D	MT	D	P	C	13.5	2100	2T	R	15	3600	AC	1.0	1	A	17.0	1	Mu	330	30
3.2	0	...	M	D	Mp	D	SS(122)	C	11.7	2158	1M, 1T	S	3	3600	WE	1.0	2	A	4.5	2	Ad	100	6
...	.....	...	M	V	M	D	G, O	G, O	1000[13]	....	1M, 1T	R	5	3600	WE	1.0	2	A	5.0	2	.....	170	11
0	10.6	Tu	MT	V	MT	Hy, D	G	G	1020[13]	....	3M, 1T	R	7.5	3600	El	1.0	3	A	11.0	2	PAd	200	20
0	9.7	Tu	M	D	M	S	P, G, O	C, G, O	.....	....	1M	R	4	3600	El	1.0	2	A	6.0	2	Mu	145	8.5
0	13.4	Tu	T	V	T	V	G	G, O	1000[13]	....	1M, 1T	R	7.5	3600	WE	.....	3	A	8.0	2	Cu	210	15.5
0	.....	Re	MT	V	MT	D	P	C, O	11.0	....	2MT	....	12.5	3600	WE	.....	..	A	...	..	.....	440	25
...	.....	Tu	Mp	V	Mp	D	P	C	12.5	2400	1M, 1T	R	5	3600	WE	1.25	3	A	5.5	2	Ad	125	10.5
0	3.7	Tu	M	D	M	D	SS(138)	C	13.4	2350	1M, 1T	R	5	3600	Wo	0.5	2	A	6.2	2	.....	310	18
0	10.0	Tu	Mp	S	Mp	S	G, O	G, O	1000[13]	....	.....	....	6	3600	GE	1.0	3	A	9.0	2	RB	137.5	12.5
4.0	20.0	Tu	M	V	Mp	D	P	C	14.6	....	2M	R	10	3600	WE	1.0	3	A	13.0	2	.....	210	16
8.1	0	...	M	V	MT	D	UF(310)	C	12.0	2200	1M	R	10	3600	AC	0.5	1	A	....	2	.....	330	30
0	3.6	Tu	MT	V	M	D	SS(140)	C	12.8	2400	1M, 1T	S	5	3600	El	15	1	A	....	..	.....	370	10
3.8	.....	...	M	D	M	D	UF(236)	C	14.0	2700	1M	R	5	3600	El	1.0	1	A	7.6	2	Ad	249	17
0	7.6	Tu	MT	S, V	MT	Ma	SS(132)	L	7.0	2220	1M	R	3	3600	GE	1.0	2	A	3.8	2	Ad	80	7
0	47.6	Tu	M	Hy	M	Hy	P	C	11.4	1950	2M, 1T	S	.....	....	...	.....	..	..	....	..	.....	800	99
...	.....	...	M	.....	M	.....	G	G	1000[13]	....	1M, 1T	....	3	3600	GE	....	2	A	...	..	.....	100	6
0	.....	Tu	T	S	M	D	SS(124)	C	11.8	1870	1M, 1T	S, R	4	3600	GE	0.5	2	A	6.0	2	Ad	110	8
0	2.5	Tu	M	V	M	V	SS(107)	C	12.1	2200	1M, 1T	R	2	3600	El	1.0	1	A	3.0	2	Ad	70	3.7
0	0	...	M	D	M	D	TG	C	11.0	....	1M, 1T	R	4	3600	AC	1.0	4	A	6.8	2	Ad	130	6
0	.....	Tu	M	V	M	V	O	O	18.5	....	1M, 1T	R	5	3600	WE	1.0	3	A	8.0	2	.....	145	9
1.0	0	...	M	V	M	V	TG(127)	C	10.5	....	1M, 1T	R	3	3600	WE	1.0	..	A	4.5	2	Ad	57	4.5
...	.....	...	...	.....	...	.....	.....	...	.....	....	.....	....	7.5	3600	WE	0.75	2	A	9.5	2	Mu	285	16
3.6	0	...	M	D	M	Hy	G, O	G, O	1000[13]	....	1T	S	3.5	3600	GE	0.5	2	A	5.0	1	Ad	103	6.25
...	.....	Tu	T	S	M	D	P	C	11.8	2200	1M, 1T	R	3	3600	GE	.....	2	A	....	2	.....	117	5.25
0	3.2	Tu	M	V	Mp	S, Da	SS(104)	C	11.6	2000	1M	R	3.5	3600	AC	0.75	2	A	3.8	1	.....	...	8
....	0	...	M	S, D	M	S, D	SS(252)	C	11.0	....	1M, 1T	S, R	7.5	3600	GE	1.0	3	A	12.0	2	AsCu	280	155
...	.....	...	...	.....	...	.....	.....	G, O	.....	....	.....	....	7.5	3600	GE	1.0	3	A	10.0	..	AsCu	110	11
0	9.7	Tu	M	Hy	M	Hy	TG(248)	L	6.5	2300	2M, 1T	....	5	3600	GE	0.75	3	A	7.0	2	AnAd	75	5
0	16.3	Re	M	V	M	D	P	C	13.0	2700	1M, 1T	R	3.5	3600	GE	0.75	2	A	4.0	2	AAd	117	5.5
2.9	0	...	MT	V	MT	V	SS(252)	C	11.1	2000	1M, 1T	R	10	3600	El	1.0	4	A	10.0	2	Ad	335	19.5
...	.....	...	...	.....	...	.....	.....	G, O	.....	....	.....	....	7.5	3600	WE	1.25	3	..	...	..	.....	170	15
...	.....	...	...	.....	...	.....	.....	...	.....	....	.....	....	10	3600	GE	0.75	3	A	13.0	2	PAd	580	40
0	0	...	T	S	T	S	O, GT	O, GT	18.4	....	3T	S	.....	....	...	.....	..	..	....	..	.....	825	0
0	0	...	T	S	T	S	O	O	.....	....	2T	S	.....	....	...	.....	..	..	....	..	.....	59	0
0	0	...	T	S, D	T	S, D	G	G	1000[13]	....	3T	S	{ 10	1800	WE	1.0	0	A	20.0	2	.....	400	10
													{ 6.25	1800	GE	1.0	0	A	9.35	2	.....	400	16
0	0	...	T	D	T	D	O	O	18.0		.....	....	.....	....	..	.....	..	..	....	..	.....	275	.....
0	0	...	M	V	MT	D	SS(120)	C	14.0	2200	2T	S	.....	....	...	.....	..	..	....	..	.....	70	0
0	0	...	MT	D	MT	D	O	O	.....	....	.....	....	.....	....	...	.....	..	..	....	..	.....	112	0

Tu —Tubular
UF —Underfeed stoker
UI —Union Iron Works
V —Vane control
Vo —Henry Vogt Machine Co
Wi —Wickes Boiler Co
WE —Westinghouse Electric Corp
Wo —Worthington Pump & Mach Corp
(123) —Stoker grate area, sq ft

1—Reheat to 1000 F
2—Reheater surface, 30,200 sq ft
3—2 fans per boiler
4—12,000 to 14,000 Btu per lb
5—2000 to 2900 F
6—Bleed at 400 psia
7—1 motor, 1 turbine, 2 fans, 1 shaft
8—One bleed point for induction steam
9—12,000 to 13,900 Btu per lb
10—Gas, 1015 Btu per cu ft
11—Reheater surface, 9500 sq ft
12—60,000-kw rating, 75,000-kw max
13—Btu per cu ft
14—2 turbines being installed
15—Extraction at 200 psig for industrial sales
16—600,000 lb per hr with 12,640-Btu subnormal coal
17—Floating power plant
18—Bought in 1946, built in 1943
19—2 units of 1 motor driving one i-d, one f-d fan
20—Cupro-nickel in top rows of condenser
21—Gas-fired, 30,350 Btu on oil
22—An i-d and f-d fan driven by one motor
23—Gas-fired, 29,800 Btu on oil
24—Reheat to 835 F
25—Radiant reheater, 2964 sq ft
26—Reheat to 900 F
27—Radiant reheater, 3414 sq ft
28—12,330 to 14,400 Btu per lb
29—2045 to 2860 F
30—12,416 to 14,066 Btu per lb
31—Coke breeze; gas tar 165,000 Btu per gal
32—Started operation Jan 1948
33—H-p element 3600 rpm, l-p element 1800 rpm
34—See also 1949 unit at 650 psi



1 Previous patterns continue in breakdown of estimated total installations in the various pressure classifications



2 Distribution of total installations by capacity groups shows the larger units dominate in terms of steam capacity

Industrial Power Activity Emphasizes

General industry continues the largest single user of firing and steam-generating equipment. Here's what is being done currently on pressures, unit capacities, firing methods, based on a comprehensive survey by POWER

▶ TABULATIONS on pp 116-122, drawn up from POWER's current survey of steam-power installations, give technical data on approximately 350 plants serving industrial establishments, institutions and governmental agencies, roughly half of estimated equipment sales. Although American industry generates only a little more than one-quarter of the electric energy it consumes, the fuel-burning and steam-generating equipment installed to meet heating and process needs in this field undoubtedly aggregates more than that in central-station service. In this respect particularly, then, the industrial field represents a major sector of the total.

For example, the pulp and paper industry ranks next to the utilities as the largest single purchaser of boiler units, in terms of numbers. Reflecting the larger average size of its units, the chemical industry, including the oil refineries, ranks next to the utilities in terms of capacity. Right behind in both classifications comes the steel industry.

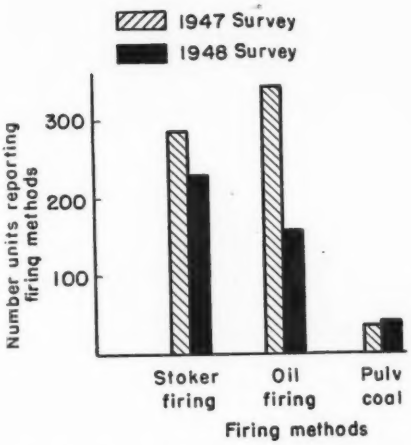
Overshadowing each of these individual sectors of the economy, as far as over-all totals go, is the new steam-generating equipment put into general industry—food, rubber, textiles, metalworking, etc, as well as the various institutions and agencies.

Construction Activity. While construction of power facilities in the industrial field has been, and is, at a relatively high level, it has not been characterized by the record-breaking pace of the utility field. Authorities advance a number of reasons for this difference. During the war years, growth in essential industrial power requirements was met partly by construction of new plants, particularly in certain industries, and partly by a directed shift to central-station power. By and large, industry came out of the war without any great backlog of unfilled power demand.

In contrast, nonessential utility loads were rigorously curtailed during the war years, and this pentup demand, abetted by population growth, left them with a tremendous capacity deficit to be made up as fast as possible. Today, we are still involved in the "catching up" process, complicated, of course, by continued rapid load growth.

Starting with a power situation reasonably in balance, industrial power construction comes from (1) extension of production facilities as distinguished from higher operating rates on existing facilities, and (2) replacement of existing power facilities for more economical operation. The first factor is undoubtedly responsible for many of the new installations in the industrial and institutional fields, but modernization has tended to lag. In the light of the postwar situation—rapidly rising costs, unsettled business conditions, and continued reconversion problems—many managements have been understandably reluctant to embark on extensive modernization programs. They have displayed a tendency to postpone such steps entirely, or to take only those that are immediately necessary and clearly justified.

Steam-Generation Trends. Fig. 1-3 above indicate some general characteristics of the steam-generation equipment that constitutes the major part of industry's power-plant construction activity. How estimated total sales for comparable periods covered by the 1947 and 1948 surveys break down by pressure groups and capacities is shown in Fig. 1 and 2. As might be expected when the comparison is made in number of units, the small sizes and low pressures clearly dominate the field. It should be noted that the POWER survey is confined to "power" boilers (100 psi and above) and thus does not include the numerically large heating-boiler field. In the capacity grouping, the number of units of 50,000 lb per hr and over is distinctly impressive and coupled with the larger unit size gives dominance to the large units when



3 For all units reporting method of firing, distribution is as shown

Steam-Making

total steaming capacity is considered.

In considering the pressure classification, remember that selection of operating pressure depends on different considerations in the industrial and utility fields. It may be reasonably assumed that the large number in the 299-psi-and-below range represents units installed primarily for process and heating loads. Where power generation is involved, of course, ratio between steam and electrical loads largely determines operating pressure. The relatively large number of units in the 400-to-799-psi range may give some weight to the thoughts that a number of authorities have put forward regarding the relatively greater increase in industrial electrical loads as compared to process-heat demands.

Fuel-Burning Equipment. Fig. 3 and the table below give a quick comparison as to trends in firing methods. Fig. 3 compares 1947 and 1948 figures for installations on which data as to firing method were available. In the 1947 figures, covering 611 plants out of a known total of about 970, oil accounted for 51.6%, stokers 43.4%, and pulverized-coal 5.0%. The current data, representing 433 out of about 630 installations, show stokers up to 53.2% and pulverized-coal up to 8.9%, with oil-firing off to 37.9%. While this may reflect the short-range tightness of fuel-oil supply, too much weight should not be given to the change in view of lack of complete data.

The table assembles, for both current and previous surveys, number of units employing stoker, oil or pulverized-coal firing, as well as the many other installations either not reporting or built for special fuels. These data are subdivided by pressure and capacity. As might be expected, stokers and oil firing dominate in the smaller plants and in those operating at low and moderate pressures. As pressure and size of steam generator increase, pulverized-coal firing becomes relatively more important.

It is of interest to note that last year one industrial plant reported an installation of a steam-generator equipped with a cyclone burner. The same company reports, this year, two additional cyclone units planned for late 1949 operation. All three units have pressurized furnaces.

Other Trends. Although not specifically covered in the survey, there is evidence of a trend to increasing use of dust collectors. In one form or another, mostly mechanical, their adoption by industry seems to be growing in response to current emphasis on reduction of air pollution. Likewise much more conservative heat-release figures are being reported, indicating a definite effort on the part of designers to build into steam-generating units the larger furnaces essential to operating flexibility where a wide range of coal characteristics must be handled now and in the future.

There is considerable evidence that industrial plants are approaching the question of feedwater treatment in a more intelligent and constructive manner. The function of water treatment is becoming more clearly understood, and proper equipment and methods are being designed into the plants, even those of modest proportions, rather than being added after trouble occurs.

Emphasis on steam-generating equipment in current industrial-power expansion and modernization programs undoubtedly reflects continued caution of management on all but essential steps, rehabilitation in the boiler house being, in general, less deferrable than in the turbine room.

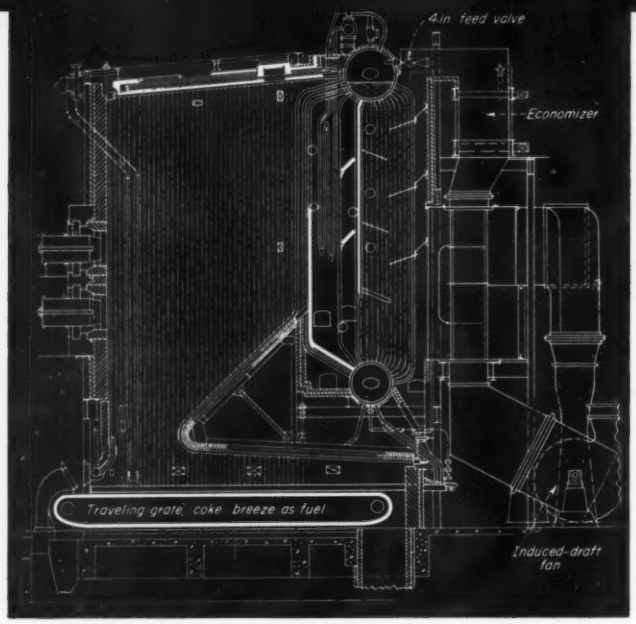
TYPE OF FIRING EQUIPMENT USED WITH INDUSTRIAL BOILERS RECENTLY ORDERED

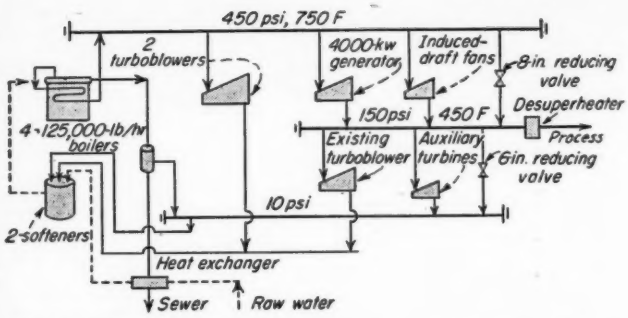
Table I—Pressure Divisions

	1947					1948			
Pressure, psi	*Stoker*	*Oil*	*Pulv*	*Unreported or otherwise*	*Pressure, psi*	*Stoker*	*Oil*	*Pulv*	*Unreported or otherwise*
299 and below	247	260	8	143	299 and below	187	138	6	115
300–399	7	14	1	20	300–399	1	6	4	13
400–599	21	24	10	73	400–599	34	7	17	12
600–799	6	27	24	34	600–799	4	8	22	35
800 and above	4	19	6	20	800 and above	8	5	15	0

Table II—Capacity Divisions

	1947					1948			
Capacity, M lb per hr	*Stoker*	*Oil*	*Pulv*	*Unknown*	*Capacity, M lb per hr*	*Stoker*	*Oil*	*Pulv*	*Unknown*
29 and below	132	130	4	133	29 and below	108	110	2	183
30– 49	58	92	4	60	30– 49	47	26	7	27
50– 74	34	30	5	55	50– 79	25	17	9	10
75–100	4	11	2	28	75–100	18	0	14	8
Above 100	24	91	31	14	Above 100	21	13	38	26





NEW POWER-PLANT EQUIPMENT ties into the present setup, and with existing hydro power meets the plant electric load

COKE BREEZE, from the steel mill, burns on chain-grate unit. The three other boilers use blast-furnace and coke-oven gas

STEEL CO OF CANADA

Expansion of all facilities has been the order of the day for the steel industry as a whole. Here's one company that built its power plant to handle steel mill byproduct fuels in boilers

▶ AS PART OF THE EXPANSION PROGRAM at the Hamilton, Ontario plant of the Steel Co of Canada a new boiler house replaces two old ones. Its steaming capacity amounts to 500,000 lb per hr supplied by four 125,000-lb-per-hr 450-psig 750-F steam generators.

One steam generator fires either blast-furnace gas or coke breeze. It has a 536-sq-ft traveling grate for coke breeze and operates at a full-load efficiency of 79.5% with this fuel. The remaining three, 125,000-lb-per-hr units, fire blast-furnace or coke-oven gas and if needed, oil. Boiler performance varies, of course, with the fuel. For instance, full-load efficiency runs 82.2% with blast-furnace gas, 81.5% with coke-oven, and 87.3% with oil.

Steam Demand. At present all 450-psig 750-F steam (300,000-383,000 lb per hr) is being reduced in pressure and temperature to 150 psig and 450 F by passing through a 4000-kw backpressure turbine in parallel with a dual pressure-reducing and desuperheating station. It serves the following plant consumers: (1) six existing blowing engines and a turboblower for three blast furnaces (2) a recently enlarged coke plant (3) rolling mills (4) miscellaneous plant uses.

In the near future two new condensing turboblowers with throttle-steam conditions of 450 psig, 750 F will replace the old blowing engines—see flow diagram above. Average plant load for 150-psi 450-F steam will drop then to 200,000 lb per hr, which can be met by exhaust from the 4000-kw backpressure turbine. Any greater demands for steam at this pressure can be delivered through the pressure-reducing station shown in the flow diagram above. This station permits meeting process demands even if steam for power decreases.

Electric power developed by the backpressure turbine supplements the hydro power now carrying the steel-plant load. Turbine size is such that it can meet emergency plant needs should the hydro system fail.

The 4000-kw backpressure turbine generates 3-phase 25-cycle energy. It has a 6-pole 125-v 750-rpm 30-kw exciter for field excitation. A gear connection steps down turbine speed from about 3600 rpm to 750 for generator operation. Steam consumption at rated load runs 42.95 lb per kwhr.

Blast-Furnace Gas. All blast-furnace gas not needed for firing blast-furnace stoves or coke ovens becomes available for the new steam generators. A gasholder control automatically stops blast-furnace gas flow to the boilers from a 1,000,000-cu-ft gas holder when storage falls to a preset amount. A butterfly valve, normally open, shuts off boiler gas flow and thereby insures that only surplus gas goes to the boiler. It reopens when gas storage exceeds the preset amount above.

When blast-furnace gas is not available for the boilers, the boiler combustion-control switches automatically either to coke-oven gas or oil.

Dust Collector. An 85,000-cfm electrical precipitator connects in parallel with present disintegrators to clean washed blast-furnace gas from three blast furnaces. It reduces dust content from 0.2 to 0.01 grains per cu ft. The precipitator has four 48-in. dia inlets and two 66-in.-dia outlets. To tie the blast-furnace gas system into the new boiler house and precipitator required adding 700 ft of 72-in. gas main and 230 ft of 84-in. gas main to the former system.

Water Treatment. A hot-process lime-and-soda treatment of 70,000 gph of raw water, with float-operated regulating valve, vent condenser, multijet spray heater and automatic sludge blowdown, acts as the first stage in water treatment. A second stage, hot-process deaeration and phosphate, follows. Water leaving this process passes through a series of filters before entering the boiler-water cycle. A continuous blowdown system on the operating boilers helps keep boiler-water concentrations within allowable limits.

PRINCIPAL NEW EQUIPMENT OF POWER PLANT

Steel Company of Canada, Ltd, Hamilton, Ontario

BOILERS AND AUXILIARIES:

Fuel-oil temperature and pressure control....Taylor Instrument Cos
Boilers, 4.....Combustion Engineering Co, Inc Ltd
1 *boiler*, blast-furnace-gas and coke-breeze fired; 2-drum, bent tube, continuous rating 125,000 lb per hr at 450 psig, 750 F at superheater outlet; guaranteed full-load efficiency, b-f gas 82.0%, c-b 79.5%; 3 *boilers*, b-f gas, coke-oven-gas and oil fired; 2-drum, bent tube, continuous rating 125,000 lb per hr at 450 psig, 750 F at superheater outlet; guaranteed full-load efficiency, b-f gas 82.2%, c-o gas 81.5%, oil 87.3%
Stoker.....Combustion Engineering Co, Inc Ltd
Traveling grate with 536-sq-ft area
Stoker drive.....Worthington Pump & Machy Corp, Ltd
Steam turbine, 5 hp, 2000-400 rpm
Air heaters, 2.....Combustion Engineering Co, Inc Ltd
1, b-f gas and breeze-fired boiler, tubular, 10,200 sq ft heating surface; 1, b-f gas, c-o gas and oil-fired boiler, tubular, 24,750-sq-ft heating surface
Economizers, 2.....The Superheater Co
1, b-f gas and breeze, finned tube, counter flow, 3190 sq ft heating surface; 1, b-f gas, c-o gas- and oil-fired boilers, finned tube, counter flow, 3040 sq ft heating surface
Superheaters.....The Superheater Co
Soot blowers.....Diamond Power Specialty Corp Ltd
Burners for b-f gas, for c-o gas.....Combustion Engrg Co, Inc Ltd
Burners for fuel oil.....Todd Shipyards Corp
Coke-breeze distributors.....Stock Engineering Co
Safety valves.....Hopkinsons Ltd
Nonreturn valves.....Edward Valve & Mfg Co, Inc
Blowdown valves.....The Okadee Co
Ashpit hopper (b-f gas and breeze-fired boiler), Hydraulic ash-disposal system, Steamatic siftings and flyash.....United Conveyor Corp of Canada, Ltd
Water pump for hydraulic ash system....Canadian Ingersoll-Rand Co
750 gpm, 243-ft head, direct connected, single stage
Turbine drive for pump, 57.5 hp at 3500 rpm.....Worthington Pump & Machy Corp
Coke-breeze conveyor system.....Jeffrey Mfg Co, Ltd
267 fpm, 95 tons per hr
Coke-breeze weightometer.....Merrick Scale Mfg Co
Combustion air venturi ducts.....Minneapolis-Honeywell Regulator Co, Ltd
Combustion control.....Hagan Corp, Dominion Flow Meter Co, Ltd
Water columns.....Reliance Guage Column Co
Water gages.....Diamond Power Specialty Corp Ltd
Safety valves.....Hopkinsons Ltd
Forced-draft fans, 4.....B F Sturtevant Co of Canada, Ltd
1, 40,000 cfm, 7-in. wg at 100 F, 1185 rpm; 3, 39,000 cfm, 8.5-in. wg at 100 F, 1240 rpm
Turbine drive for f-d fans, 4.....Worthington Pump & Machy Corp
1, 68 hp at 4621-1170 rpm; 3, 75 hp at 4530-1260 rpm
Induced-draft fans, 4.....B F Sturtevant Co of Canada, Ltd
1, 136,000 cfm, 10.5-in. wg at 405 F, 1002 rpm; 3, 136,000 cfm, 11.0-in. wg at 391 F, 1035 rpm
Turbine drive for i-d fans, 4.....Worthington Pump & Machy Corp
1, 369 hp at 3646-1002 rpm; 3, 380 hp at 3766-1035 rpm

FEEDWATER AND CONDENSATE SYSTEM:

Boiler feed pumps, 3.....Canadian Ingersoll-Rand Co Ltd
650 gpm, 1455-ft total head, 3550 rpm, 4 stage
Turbine drive for boiler-feed pumps, 3.....Worthington Pump & Machy Corp
340 hp at 3550 rpm
Automatic feed-pump control, Copes, Feedwater regulators, 4, Copes.....Northern Equipment Co
Condensate pump.....Canadian Ingersoll-Rand Co Ltd
115 gpm, 155-ft total head, 1930 rpm, 2 stage
Turbine drive for con pump, 15 hp at 1930 rpm...Coppus Engrg Corp

WATER-TREATING SYSTEM:

Sedimentation tank, 1st and 2nd stages—Canadian Allis-Chalmers Ltd
1st stage, hot-process lime-and-soda treatment of 70,000-gph raw water, float-operated regulating valve, vent condenser, multijet-spray heater, automatic sludge-blowdown equipment, motor-driven sludge-recirculating pump; *2nd stage*, hot-process deaeration and phosphate treatment of 52,000 gph of lime-and-soda-softened water and deaeration of 18,000 gph of condensate with float-operated regulating valve, vent condenser, multijet-spray heater, automatic sludge-blowdown equipment, motor-driven sludge-recirculating pump
Filters, 7.....Canadian Allis-Chalmers, Ltd
4 *new*, vertical pressure, capacity 14,200 gph each to filter feedwater to 4 new boilers; 3 *re-used*, from existing plant, vertical pressure, to filter feed to open-hearth waste-heat boilers
Chemical-feed tanks, 3, 10 ft 9 in. dia x 6 ft high with proportioners for individually proportioning lime, soda and phosphate to softeners.. Chemical pump sets, 3, driven with Coppus steam turbines.....Canadian Allis-Chalmers Ltd
Chemical feeders, 5.....National Aluminate Corp
1, Alchem low pressure; 4, Alchem high pressure
Treated-water booster pumps, 2.....Canadian Allis-Chalmers Ltd
1400 gpm, 90-ft total head, 1750 rpm, single stage
Turbine drive for t-w booster pump.Worthington Pump & Machy Corp
50 hp, 1750 rpm
Continuous blowdown system.....Canadian Allis-Chalmers Ltd
Capacity 24,100 lb blowdown per hr or 6.73% of makeup; heat exchanger, 225 sq ft heating surface
Raw-water booster pumps, 2.....Canadian Allis-Chalmers Ltd
1700 gpm, 65-ft total head, 1750 rpm
Turbine drive for r-w booster pumps.Worthington Pump & Machy Corp
35 hp at 1750 rpm

FUEL-OIL SYSTEM:

Fuel-oil pumps, 2.....Quimby Pump Co, Inc
75 gpm, 5-ft suction head, 145-psi discharge head, viscosity (Furol) 75-90, 122 F
Turbine drive for f-o pumps, 15 hp, 1450 rpm....Coppus Engrg Corp
Fuel-oil transfer pump (re-used).....Smart Turner Machine Co
Duplex steam pump 6x1¾x7 in.
Fuel-oil suction heater.....Foster Wheeler Ltd
4000 gph, heat oil from 0 to 120 F, 920 sq ft
Fuel-oil discharge heater.....Davis Engineering Corp
4000 gph, heat oil from 110 to 210 F
Fuel-oil filters.....Cuno Engineering Co

TURBINE-GENERATOR, PRESSURE-REDUCING STATIONS:

Generator, 4000 kw, and exciter...Canadian General Electric Co Ltd
Generator, 3 phase, 25 cycle, .80 pf, 4 pole, 6900 v; exciter, 30 kw, 6 pole, 125 v; 750 rpm
Turbine and gear of generator.....Worthington Pump & Machy Corp
3592-750 rpm, 450 psig, 750-F throttle steam, 160-psig backpressure, 42.95 lb per kwhr at rated load, exhaust 558 F
Generator air cooler, 3400 sq ft....Canadian General Electric Co Ltd
Oil purifier.....De Laval Separator Co
Switchgear, metalclad.....Canadian Westinghouse Co Ltd
Pressure-reducing stations, 2.....The Swartwout Co
Dual station, 2-8-in. reducing valves; each station—reducing 250,000 lb per hr from 410-160 psig, desuperheating 400,000 lb per hr to 450 F; *single station*, 1-6-in. reducing valves, 60,000 lb per hr from 140 psig, 450 F, to 5 psig
Metering for p-r stations.....Dominion Flow Meter Co Ltd
Desuperheater pumps, 2.....Canadian Ingersoll-Rand Co Ltd
Desuperheater pump turbines, 2.....Coppus Engineering Corp

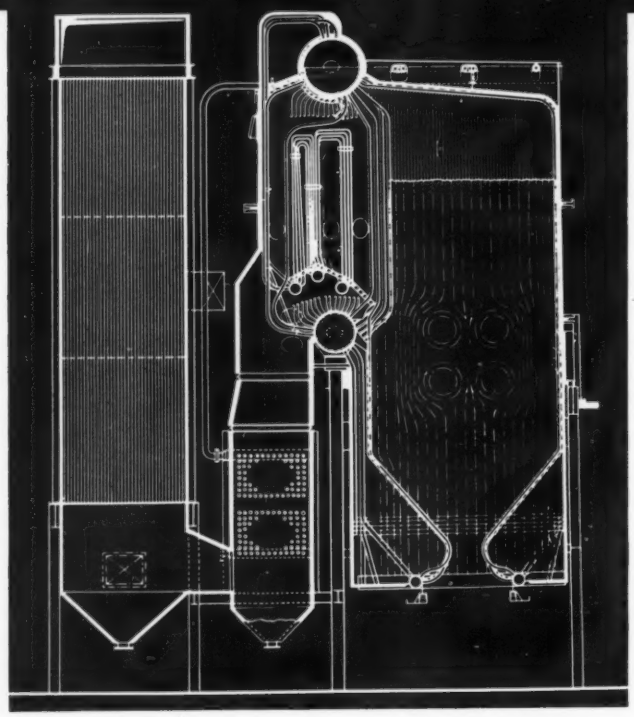
INSTRUMENTS:

Flowmeters: steam, water, oil, air, c-o and b-f gas. Recorders: drum level, pressure and temperature.....Minneapolis-Honeywell Regulator Co, Ltd
Recorders: oxygen, pH, multipoint temperature..Leeds & Northrup Co
Pressure gages.....Manning, Maxwell & Moore, Inc
Multipoint draft gages.....Dominion Flow Meter Co Ltd

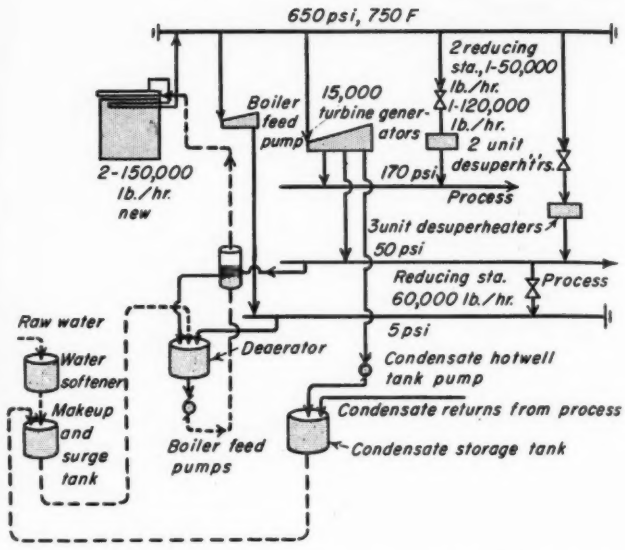
MISCELLANEOUS EQUIPMENT, PIPING & VALVES:

Boiler test pump.....Union Steam Pump Co
Air Compressor (re-used).....Chicago Pneumatic Tool Co
Condensate & trap return pump.....Gerow-Smith Co
Pipe, tank, turbine insulation.....Canadian Johns-Manville Co Ltd
Valves.....Crane Ltd; Edward Valves, Inc
Blast-furnace-gas goggle valves.....William M Bailey Co
Butterfly valves.....Arthur G McKee & Co; American Steel Dredge Co, Inc
Coke-oven-gas regulator.....Chapin-Fulton Mfg Co
Raw-water strainers.....H Hellan
Turbine-room hoist, 16 tons.....Canadian Fairbanks-Morse Co Ltd
Boiler-room hoist, 5 tons.....Canadian Fairbanks-Morse Co Ltd
Boiler-house basement hoist, 2 tons.Canadian Fairbanks-Morse Co Ltd
Chemical-storage hoist, 2 tons.....Chishold-Moore Hoist Corp
Unit heaters & radiators.....C A Dunham Co Ltd
Power-piping fabrications.....Crane Co Ltd; Flori Pipe Co
Blast-furnace-gas piping, fabrications.....Toronto Iron Wks Ltd

CONSULTING ENGINEERS.....Arthur G McKee & Co



HEART OF NEW POWER PLANT is two 150,000-lb-per hr boilers. 24,100 sq ft air heater takes up less than half boiler width



STEAM DEMANDS for both high-pressure turbine-generator and lower-pressure process use can be delivered by layout above

SPRINGS COTTON MILLS

Textile industry has always used considerable steam for process, and in the latest plants a large power source is needed for modern drives

► THE NEW BLEACHERY DIVISION of the Springs Cotton Mills at Grace, S. C. represents one of the largest and most modern plants of its kind. Characteristic of the progressive thinking is a large-scale, fully equipped power plant, whose entire installation was engineered for an ample supply of steam and water.

Steam supply comes from two 650-psi 750-F steam generators of 150,000-lb-per-hr capacity. Furnace volume is 9000 cu ft, total heating surface is 10,673 sq ft, and heat release, at normal load, 21,600 Btu per cu ft per hr. An economizer of 2618 sq ft and a tubular air heater of 24,100 sq ft are provided. A system of pulverized-coal firing is used with oil as a second fuel choice.

A main header receives the 650-psi 750-F steam for distribution within the power plant. Coming off this header are a 15,000-kw turbine-generator, a turbine-driven boiler-feed pump, and a series of six pressure-reducing stations.

Process steam goes out at two pressure levels, 170 and 50 psi. All steam for the 170-psi service comes through two of the six pressure-reducing stations and from a bleed point on the turbine-generator unit.

A second bleed point on the turbine unit provides steam at 50 psi and, coupled with output from three pressure-reducing stations, operating off the 650-psi header, handles process-steam requirements at this level.

The 50-psi header acts as a steam source for the sixth pressure-reducing station to deliver steam at 5 psi. This 5-psi steam along with the 5-psi exhaust from the boiler-feed-pump turbine acts as a heating source for general plant service and for raising the temperature of the deaerator within the power house.

Bleachery Connections. An underground tunnel about 250 ft long connects the power plant with the bleachery. In this tunnel are (1) 12-in. line for condensate returns (2) 24-in. line delivering the 50-psi process steam (3) 10-in. line for the 170-psi process steam (4) 20-in. cold-water process line. This tunnel extends under the bleachery, and risers from the steam lines and cold-water process go up at various points within the bleachery.

In addition to the large steaming requirements an even larger need for process water must be met. A raw-water pumping station, on the Catawba river, pumps water ¾ of a mile to a reservoir that contains 20,000,000 gallons of raw water.

Water for the power plant flows from this raw-water reservoir through the 22,500-sq-ft condenser as circulating water. After its service as a condensing medium the raw water discharges to a sluice. A second pumping station takes water from the sluice and directs it to the filter plant.

After filtering, water enters a 5,000,000-gallon reservoir that acts as a supply source for process water and for a 150,000-gallon tank assigned for fire protection.

All filtered water for power-plant service continues to a double unit, carbonaceous-zeolite water softener. From here it goes to a makeup and surge tank. This last-named tank supplies required water to the 450,000-lb-per-hr tray-type deaerator.

The deaerator, in turn, ties into the suction line of two 4-stage boiler-feed pumps, capable of delivering water at 875 psi to the boiler drum.

Electrical Load. Most of the process-

ing machines use dc motors. The electrical energy generated by the power-plant turbine at 13,800 v, 60 cycles, is stepped down for plant distribution to 600 v, 60 cycles. Off this plant distribution bus three motor-generator rooms, spotted at convenient load centers throughout the bleachery, convert the available ac to dc through m-g sets and necessary switchgear.

Following table lists the principal bleachery power-plant equipment.

PRINCIPAL EQUIPMENT OF BLEACHERY POWER PLANT

Springs Cotton Mills, Grace, S. C.

STEAM GENERATORS AND AUXILIARIES:

Boilers, 2,150,000 lb per hr. 650 psi. 750 F.
Superheaters, 2, loop tube, 150,000 lb per hr
Burners, 8, combination oil and pulv coal.
Burner elements, 8, oil burners, steam-atomizing
Preheaters, 2, tube type, 24,100 sq ft....
Economizers, 2, continuous loop, 2618 sq ft
Pulverizers, 4, direct firing, 221BA, size 41
— Babcock & Wilcox Co

Soot blowers, 18: 14 rotary units, 650 psi; 4 retractable units, 650 psi
Water columns, 2, reflecting, high and low alarms
— Diamond Power Specialty Corp

Safety valves, 6 — Consolidated Safety Valve Div
Blowoff valves, 14 — Yarnall-Waring Co
Ash-disposal system — Hydro-Ash Corp
Coal-handling system — Link-Belt Co
Coal scales, 4 — Richardson Scale Co
Dust collectors, mechanical, 650,000 cfm — Western Precipitation Corp
Forced-draft fans, 2 — B F Sturtevant Co
Horizontal, double width, double inlet, outlet damper control
F-d fan motors, 2 — Westinghouse Elec Corp
100 hp, 1200 rpm, constant speed
Induced-draft fans, 2 — B F Sturtevant Co
Horizontal, double width, double inlet, outlet damper control
I-d-fan motors, 2 — Westinghouse Elec Corp
300 hp, 900 rpm, constant speed
Stacks, 2 — Babcock & Wilcox Co
86 ft high by 6 ft dia, self-supporting steel

ELECTRIC GENERATORS AND AUXILIARIES:

Turbine-generator, 1, 18,750 kva, 3600 rpm — Westinghouse Elec Corp
0.8 pf, condensing automatic and nonautomatic extraction
Air coolers, 2 — Westinghouse Elec Corp
7340 sq ft cooling surf for 36,000 cu ft per min, parallel flow
Oil coolers, 1 pair, twin units — Westinghouse Elec Corp
Shell and tube type
Condenser — Westinghouse Elec Corp
22,500 sq ft, 2-pass, Admiralty brass tubes

WATER-TREATMENT SYSTEM AND AUXILIARIES:

Water softeners, carbonaceous zeolite, double unit — Cochrane Corp
Chemical pumps, 3 — Milton Roy Co
2 phosphate; 1 sodium sulphite for internal treatment
Deaerator, 1, tray type, 450,000 lb per hr — Cochrane Corp
Stage feedwater heater, 1 — Lummus Co
Continuous blowoff heat exchanger — Cochrane Corp

PRESSURE REDUCERS, CONTROLS, INSTRUMENTS

Pressure reducers, 6 — Bailey Meter Co
3, 125,000 lb per hr, 650-50 psi; 1, 50,000 lb per hr, 650-170 psi; 1, 120,000 lb per hr, 650-170 psi; 1, 60,000 lb per hr, 50-5 psi
Desuperheating stations, 2 — Bailey Meter Co
1, 2-unit, 170 psi; 1, 3-unit, 50 psi, spray type
Combustion controls, feedwater controls
Recorders, boiler temp, steam and water temp, water levels, steam and water pressures
Indicators, flow
— Bailey Meter Co
Indicators, level — Yarnall-Waring Co

PUMPS AND COMPRESSORS:

Boiler feed, 2, 4-stage, 3600 rpm, 875 psi — De Laval Steam Turb Co
Boiler-feed motor, 1, 600 hp, 3600 rpm — Westinghouse Elec Corp
Boiler feed turbine, 1 — De Laval Steam Turbine Co
600 hp, 3600 rpm, 650 psi
Vacuum pumps, 2, H-5 Hytor — Nash Engineering Co
175 cu ft per min at 20-in. vacuum, 15 hp, 1150 rpm
Vacuum-pump motors, 2 — Westinghouse Elec Corp
1150 rpm, 15 hp, constant speed
Fuel-oil pumps, 2 — De Laval Steam Turbine Co
15 gpm, 1800 rpm, 200 psi, IMO pumps
Fuel-oil pump motors, 2, 5 hp, 1800 rpm — Westinghouse Elec Corp
Process condensate pumps, 4 — De Laval Steam Turbine Co
275 gpm, 130-ft head, 1750 rpm
Process condensate pump motors, 4 — Westinghouse Elec Corp
15 hp, 1750 rpm
Ash pump, 1, 1000 gpm, 860 rpm, 109-ft head — Morris Machine Works
Ash-pump motor, 1 — Westinghouse Elec Corp
1760 rpm, 50 hp, constant speed
Sluice pump, 1, 1000 gpm, 268 ft, 1780 rpm — Ingersoll-Rand Co
S-p motor, 1, 100 hp, 1780 rpm, const speed — Westinghouse Elec Corp
Booster fire pump, 1 — Peerless Pump Div, Food Machinery Corp
1000 gpm, 1750 rpm, 50-psi net head
Booster fire-pump turbine, 1 — Moore Steam Turbine Div, Worthington
55 hp, 1750 rpm, 650 psi, noncondensing
Air compressors, 2, ES-1, 7x7, 400 rpm, 100 psi — Ingersoll-Rand Co
Air-compressor motors, 2 — Crocker Wheeler Elec Mfg Co
20 hp, 1750 rpm
Hotwell pumps, 2, 570 gpm, 2-stage, 1160 rpm
Hotwell-pump motors, 2, 40 hp, 1160 rpm
— Westinghouse Elec Corp
Vacuum-cleaning system pump, 1 — U. S. Hoffman Machinery Corp
Vacuum-cleaning pump motor, 3 hp — Reliance Elec & Engrg Co

TANKS:

Storage tanks, 5: 1, 19 ft dia, 18 ft high, surge & makeup, 38,200 gal; 2, 10 ft dia, 25 ft, 8 in. long, fuel oil, 15,300 gal; 2, 8 ft, 6 in. dia, 20 ft long, condensate storage, 8860 gal
Vacuum tank, 1, 4 ft dia, 6 ft high
Blowoff tank, 1, 5 ft dia, 16 ft long, 2360 gal
— R D Cole Mfg Co
Compressed-air receivers, 2 — Ingersoll Rand Co
3 ft, 6 in. dia, 10 ft high

STATION ELECTRICAL EQUIPMENT:

13,800-v switchgear and control
600-v switchgear and control
— Westinghouse Elec Corp
Transformers, 2 — R E Uptegraff Mfg Co, Inc
1, 75-kva lighting; 1, 50-kva lighting
Transformers, 4 — General Elec Co
2, 1500-kva station service; 2, 7500-10,000 kva
Control storage battery — Electric Storage Battery Co
1, 60 cell, 125 v, RC, 89 F; 1, ES, Exide charge control with copper oxide charges
Potheads — G&W Electric Specialty Co
Power-distribution cabinets — Westinghouse Elec Corp
550-v motor controls and pushbutton controls
Cable, synthetic and oil base — General Electric Co & Okonite Co
Wire and cable, varnished-cambric insulated — General Electric Co
Cable — General Electric Co & American Steel & Wire Co
15 kv, paper insulated, lead covered
Interphone system — Stromberg-Carlson Co

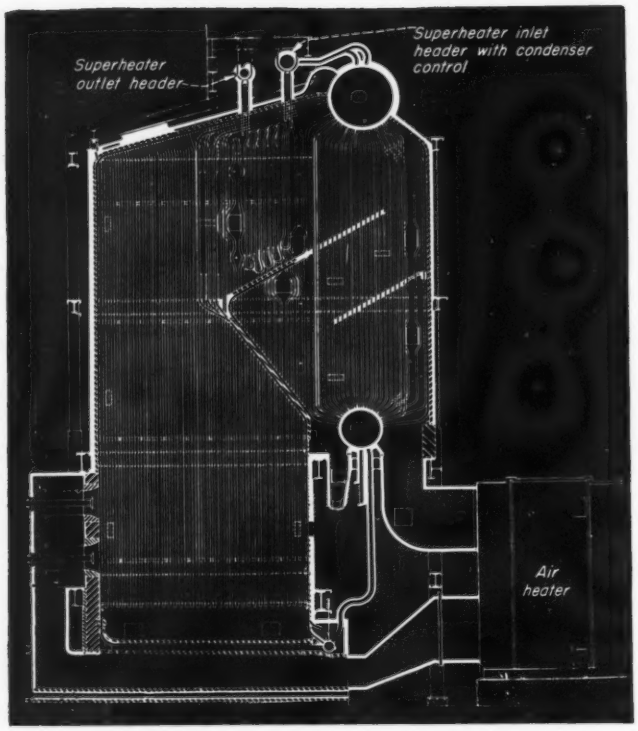
PIPING, VALVES AND ACCESSORIES:

Piping — Grinnell Co, Inc
Piping, condenser water — American Locomotive Co
36- and 42-in. welded steel
Couplings for condenser-water piping — Dresser Mfg Div
Valves — Lunkenheimer Co
1500-psi boiler nonreturn valves; feed-line stop and check valves; header valves; 1500, 600, 250 and 150 psi miscellaneous
Valves, check — Williams Gauge Co
Boiler-feed pump-discharge; makeup-water
Valves, motor operated — Chapman Valve Mfg Co
Condenser-water and steam
Valves — Atwood & Morrill Co
Nonreturn on automatic and nonautomatic extraction lines
Pressure-relief valves — Manning, Maxwell & Moore, Inc
Liquid-level control valve — Cochrane Corp
For continuous blowdown flash tank
Expansion joints, copper, corrugated — E B Badger & Sons Co
Traps, 1500 psi — Yarnall-Waring Co
Traps, low-pressure — Armstrong Machine Works
Sample coolers — Cochrane Corp
Strainers, fuel oil — Elliott Co
Press gages, industrial thermometers — Manning, Maxwell & Moore Inc

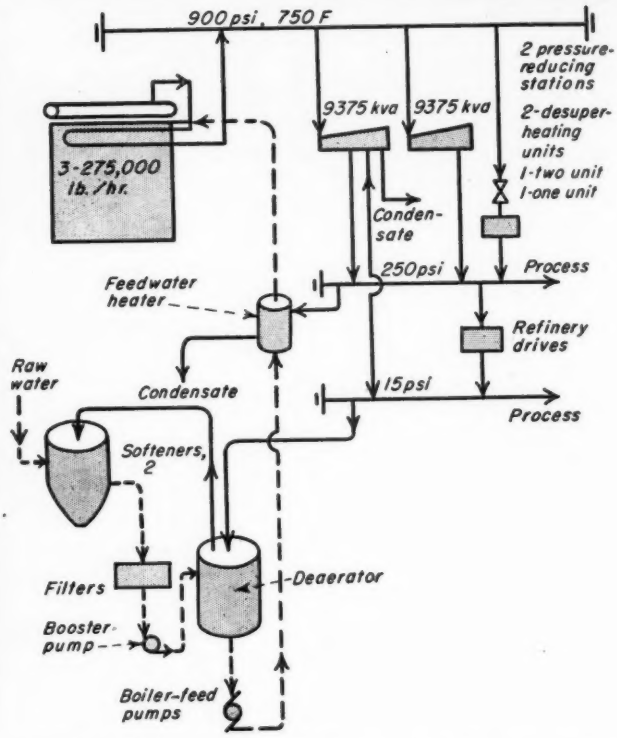
BUILDING:

Ventilators, roof — Swartwout Co
Unit heaters — Grinnell Co, Inc
Convectors — Trane Co
Turbine room crane — Whiting Corp

CONSULTING ENGINEERS — Robert & Co



STEAM GENERATION for both process and power comes from three gas or oil-fired 275,000-lb-per-hr 900-psi 750-F units



PRESSURE-REDUCING STATIONS team up with main turbine units to assure steam flow at the required pressures at all times

EAGLE POINT WORKS

The entire oil refinery industry has been expanding all its facilities to keep abreast of the staggering demand for oil products. Here's The Texas Co's latest effort—a new refinery

► THE OIL INDUSTRY has been spending heavily on its producing equipment in an effort to meet unprecedented post-war demands for its products. Considerable thought and energy have been given to the problem of getting production facilities ahead of demand, and yet winding up with plant layouts capable of flexible, efficient operation.

Power and steam for refinery use constitute a large part of the over-all problem. The Texas Co in planning its new Eagle Point Works at Westville, N. J. has settled on a power-plant design that fits these requirements of flexible and efficient operation.

Steam Generators. Flow diagram above indicates the major elements in the new power plant. Steam at 900 psi, 750 F comes from three 275,000-lb-per-hr steam generators. These units have a maximum heat release of 30,000 Btu per cu ft per hr, a furnace volume of 11,850 cu ft, and a total heating surface of 26,300 cu ft. A pendant type superheater is used. It has a bundle of small tubes in the inlet header, see diagram, through which a varying quantity of feedwater circulates. The relatively cool feedwater condenses a portion of the steam leaving the boiler drum. This changes moisture content of steam entering the superheater elements and thereby controls steam temperature at superheater outlet. There is no economizer; a 73,200-sq-ft regenerative air heater is used. Oil or gas serves as fuel for these units.

Plant Hookup. All steam output, see flow diagram above, enters a 900-psi header for distribution. Coming off this header are two turbine-generators, both rated at 7500 kw, 0.8 pf, and two pressure-reducing and desuperheating stations. One turbine is a back-pressure unit exhausting into a 250-psi header. The second is a mixed-pressure design with (1) extraction at 250 psi (2) extraction or induction at 15 psi (3) exhaust at 27.5 in. of mercury.

The pressure-reducing stations take steam from the 900-psi level and introduce it to the 250-psi header. One handles 350,000 lb per hr, and the other, 300,000 lb per hr. The desuperheating facilities consist of one 2-unit and one single-unit station. These pressure-reducing and desuperheating stations furnish flexibility to the source steam supplying process needs or power-generation demands.

Steam from the 250-psi header goes to refinery process, various mechanical drives throughout the refinery, and to a high-pressure closed feedwater heater.

The lowest-pressure steam system operates at 15 psi. It receives steam from the exhaust of the refinery drives operating at 250 psi, and sometimes from the mixed-pressure 900-psi 7500-kw turbine-generator. It supplies (1) refinery process (2) heat for raising the temperature of the deaerating heater (3) sometimes additional steam for the last few stages of the mixed-pressure turbine referred to above.

Water Cycle. Two 1200-gpm raw-wa-

PRINCIPAL POWER-PLANT EQUIPMENT, THE TEXAS CO

Eagle Point Works, Westville, N. J.

STEAM GENERATORS AND AUXILIARIES:

Boilers, three, 275,000 lb per hr.....Foster Wheeler Corp
900 psi, 750 F
Superheaters, 3.....Foster Wheeler Corp
Loop tube, 275,000 lb per hr
Burners, 18, combination oil and gas.....Peabody Engineering Corp
Air heaters, 3.....Air Preheater Corp
Ljungstrom regenerative type, 73,200 sq ft
Soot blowers, 42.....Diamond Power Specialty Corp
Water columns, 6.....Diamond Power Specialty Corp
Safety valves, 9.....Crosby Steam Gage & Valve Co
Blowoff valves, 6, tandem sets.....Edward Valves Inc
Forced-draft fans, 6.....Green Fuel and Economizer Co
Horizontal, single inlet, inlet and outlet control dampers
Induced-draft fans, 6.....Green Fuel and Economizer Co
Horizontal, single inlet, inlet and outlet control dampers
Draft-fan motors, 6.....General Electric Co
450 hp, 1200 rpm, constant speed
Stacks, 3.....Chicago Bridge and Iron Co
85 ft high by 9 ft dia, self-supporting steel

ELECTRICAL GENERATORS & AUXILIARIES:

Turbine-generators, 2.....Westinghouse Electric Corp
1-9375 kva, 3600 rpm, 0.8 pf, noncondensing; 1-9375 kva,
3600 rpm, 0.8 pf, condensing automatic extraction-induction
Air coolers, 2.....Westinghouse Electric Corp
2130 sq ft cooling surface for 16,500-cfm air flow
Oil coolers, 2 pr twin coolers.....Westinghouse Electric Corp
Shell and tube type
Condenser, 1.....Westinghouse Electric Corp
7500 sq ft, 2-pass, arsenical copper tubes
Deaerators, 1.....Liquid Conditioning Corp
Spray type, 875,000 lb per hr
Feedwater heater, 1, closed, high pressure.....Foster Wheeler Corp
Heat exchanger continuous blowoff.....Permutit Co

WATER-TREATMENT SYSTEM AND AUXILIARIES:

Water softeners, 2-stage.....Permutit Co
First stage, lime and magnesium oxide; second stage, phosphate
Filters, 8.....Permutit Co
Chemical pumps and feeders: caustic or soda ash, 3; phosphate, 3
Ingersoll-Rand Co
Chemical pumps and feeders: sulphite, 1; phosphate, caustic or
sulphite, 2.....Milton Roy Co

PRESSURE REDUCERS, CONTROLS, INSTRUMENTS:

Pressure reducers, 2, 900 to 250 psi.....Hagan Corp
One, 350,000 lb per hr and one 300,000 lb per hr
Desuperheating stations, 2, 250 psi.....Hagan Corp
One 2-unit and one 1-unit
Combustion controls.....Hagan Corp
Feedwater controls.....Northern Equipment Co
Flow-level recorders.....Republic Flow Meters Co
Pressure recorders.....Brown Instrument Co
Temperature and conductivity recorders.....Leeds & Northrup Co
Level indicators.....Yarnall-Waring Co
Ratio-flow controllers.....Taylor Instrument Co's

PUMPS AND COMPRESSORS:

Boiler-feed pumps, 3.....Byron Jackson Co
6 stage, 3600 rpm, 1180 psi
Boiler-feed motors, 2, 900 hp, 3600 rpm.....General Electric Co
Boiler-feed turbines, 2, 900 hp, 3600 rpm, 250 psi.....Elliott Co
Fuel-oil pumps, 2.....Worthington Pump & Machy Co
180 gpm, 520 rpm, 200 psi
Fuel-oil pump motor, 1, 40 hp, 1800/520 rpm.....General Electric Co
Fuel-oil pump turbine, 1.....Worthington Pump & Machy Co
34.5 hp, 3600/520 rpm, 250 psi
Raw-water pumps, 2.....Ingersoll-Rand Co
1200 gpm, 194-ft head, 1750 rpm
Raw-water pump motor, 1, 125 hp, 1800 rpm.....General Electric Co
Raw-water pump turbine, 1.....Elliott Co
125 hp, 4400/1750 rpm, 250 psi
Treated-water pumps, 2.....Ingersoll-Rand Co
2400 gpm, 190-ft head, 1750 rpm
Treated-water pump motor, 1.....General Electric Co
150 hp, 1800 rpm
Treated-water pump turbine, 1.....Elliott Co
150 hp, 4400/1750 rpm, 250 psi
Process-condensate pumps, 2.....Ingersoll-Rand Co
350 gpm, 176-ft head, 3500 rpm
Process-condensate pump motor, 1.....General Electric Co
25 hp, 3600 rpm
Process-condensate pump turbine, 1.....Elliott Co
25 hp, 3500 rpm, 250 psi
Backwash pump, 1.....Ingersoll-Rand Co
1500 gpm, 98-ft head, 1750 rpm
Backwash pump motor, 50 hp, 1760 rpm.....General Electric Co
Hotwell pumps, 2.....Westinghouse Electric Corp
190 gpm, 209-ft head, 1760 rpm
Air compressors, 3.....Worthington Pump & Machy Co
Two-stage, 277 rpm, 125 psi
Air-compressor motors, 3.....General Electric Co
300 hp, 277 rpm, synchronous
Instrument-air compressors, 2.....Ingersoll-Rand Co
Single-stage, steam driven, 285 rpm, 50 psi
Instrument-air compressor, 1.....Westinghouse Air Brake Co
Cross compound, 2-stage, 120 cfm, 80 psi

STATION ELECTRICAL EQUIPMENT:

Switchgear and control, 13,800 v.....General Electric Co
Switchgear and control, 2400 v.....Westinghouse Electric Co
Switchgear, 600 v.....Trumbull Electric Co
Control center, 440 v.....Trumbull Electric Co
Transformers, 6:
2-13,800/2400 v, 7500-kva station service....Westinghouse Elec Co
2-2400/440 v, 200-kva station service.....Standard Transformer Co
2-2400/208/120 v, 4-wire.....Standard Transformer Co
200-kva station service
Control storage battery, 1.....Electric Storage Battery Co
60 cell, 125 v
Motor-generator set and control panel, 1.....Electric Products Co
Master clock, 1.....Telechron, Inc

PIPING, VALVES AND MISCELLANEOUS:

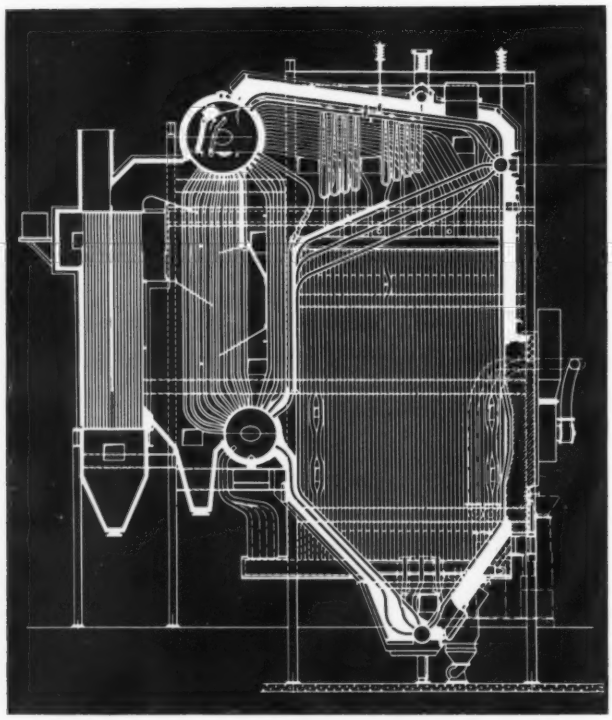
Piping.....The Texas Co
Piping hangers.....Grinnell Co, Inc
Valves.....Edward Valves Inc
Boiler nonreturn valves, feed-line stop and check valves
Valves, motor-operated, steam-header.....Chapman Valve Mfg Co
Valves, nonreturn on extraction lines.....Atwood & Morrill Co
Pressure-relief valves.....Crosby Steam Gage & Valve Co
Expansion joints.....Zallea Bros & Johnson
Steam traps.....Clark Mfg Co
Sample coolers.....Leeds & Northrup Co
Strainers, fuel oil.....Elliott Co
Pressure gages.....Crosby Steam Gage & Valve Co
Storage tanks.....Hammond Iron Works
2-60 ft dia x 40 ft high—raw water 20,145 bbl
2-60 ft dia x 40 ft high—treated water 20,145 bbl
2-40 ft dia x 42 ft high—condensate 9,400 bbl
2-40 ft dia x 42 ft high—fuel oil 9,400 bbl
Flash tanks, 2.....Permutit Co
1-30 in. dia x 5 ft, 250 psi; 1-60 in. dia x 5 ft, 15 psi
Compressed-air receivers, 3:
1-5 ft dia x 40 ft long.....The Texas Co
1-4 ft dia x 12 ft high.....Chicago Pneumatic Tool Co
1-24 9/16 in. dia x 66 in. high.....Westinghouse Air Brake Co
Ventilators.....Swartwout Co
Turbine-room crane.....Shepard-Niles Crane & Hoist Co
Treating-plant crane.....Manning, Maxwell, & Moore, Inc

CONSULTING ENGINEERS.....Jackson & Moreland

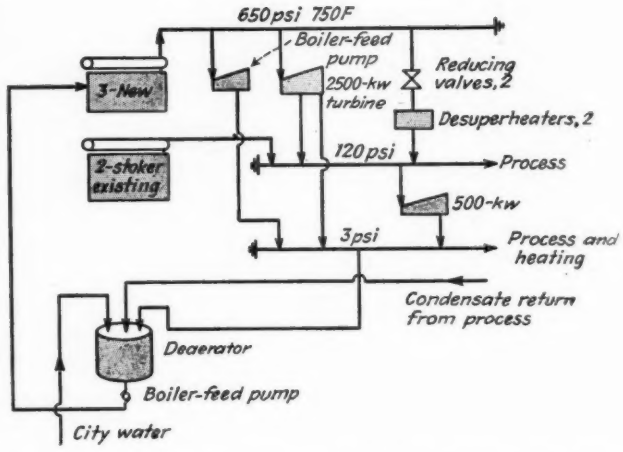
ter pumps feed water to a 2-stage water-softening system. First stage is a lime and magnesium oxide one, while the second supplies a phosphate treatment. Steam for heating use in the softeners passes first through the deaerator.

Water leaving the softeners passes through a system of eight filters before entering the suction of a booster pump. From this point the treated water meets with condensate returns at the 875,000-lb-per-hr spray-type deaerator. All water then goes through the boiler-feed pumps into a high-pressure closed feedwater heater, and finally to the steam generators.

Once the water gets into the boiler drums and enters the boiler circulating system it receives no further water treatment. The concentration of allowable solids is held in line by a continuous blowdown system. Some sulphite is added at the deaerator to help mop up any oxygen that may be present.



LATEST ADDED STEAMING CAPACITY for buildings and growing load is a 50,000-lb-per-hr pulverized-coal-fired boiler



FLEXIBLE SUPPLY for steam to both plant process and power generation employs reducing valve and desuperheating station

NORTON CO

Large Worcester, Mass. manufacturing concern expands its power plant to keep ahead of growing process and power needs

PLANT EXPANSION, including new buildings and a greater demand for electric energy and process steam, made the recent addition to the C Street power house, of the Norton Co. Worcester, Mass., an important element in meeting and planning for future growth.

By 1939, considerable progress had been made in preparing for expected load growth as far as it could be determined by conditions at that time. Two 50,000-lb-per-hr pulverized-coal-fired high-pressure steam generators, designed for 690-psi drum pressure and 650-psi turbine throttle pressure, were ready to come on the line, replacing two of four older low-pressure (125-psi) stoker-fired units. The remaining two low-pressure units served as standby in summer, but were on the line all the time through the winter. Steam for locomotives used on the plant grounds came off the high-pressure units. These locomotives use steam at 440 psi. Despite this enlargement of steam-generating facilities, plant growth since 1939 has made additional steam- and electric-generating capacity a necessity.

New Equipment. Latest addition is a 50,000-lb-per-hr pulverized-coal-fired unit operating in parallel with the still fairly new 1939 units.

The additional steam generator is designed for 690-psi drum pressure and 650 throttle. The unit has a furnace volume of 3700 cu ft, a total heating surface of 15,070 cu ft, a heat release of 18,800 Btu per cu ft and a tubular air heater of 5900 cu ft. The entire setting is steelclad. The two older 1939 pulverized-coal boilers are equipped with economizers but this most recent unit is not. The three steam generators (one new, two older) all supply 650-psi 750-F steam to a main header for distribution within the power plant itself.

Off this header, see flow diagram above, comes a 60,000-lb-per-hr 3600-rpm turbine-driven boiler-feed pump, a 2500-kw extraction turbine and two pressure-reducing valves, 650-120 psi. Ideal heat balance would call for full use of extraction turbines and boiler-feed pump. But in industrial steam plants heavy demands for process and power rarely occur together. Because this is so, the pressure-reducing stations had to be included. They give to the station a flexibility that permits supplying full plant process needs no matter how electric-power demand varies.

Below the 650-psi level and receiving steam from three sources is a 120-psi steam header. These three sources are: (1) two existing stoker-fired boilers, (2) 120-psi bleed point from the 2500-kw turbine-generator (3) output from the two 3-in. steam-pressure-reducing valves and desuperheater stations.

From this 120-psi header comes the plant process steam as well as steam for a 500-kw 3600-rpm station-service turbine-generator.

Below this pressure level runs a 3-psi steam main. It receives the exhaust of the high-pressure turbine-driven boiler-feed pump, the exhaust of the 2500-kw main turbine-generator, and also the exhaust from the 500-kw station-service turbine-generator. Steam at this pressure level goes to some limited process points and to raise the temperature in the 120,000 lb-per-hr deaerator, but the majority enters the heating system.

Condensate Return. Although plant buildings spread out over a considerable area and about 20% of the steam

used in process becomes contaminated, close to 80% of condensate is returned. Makeup, roughly about 20%, consists of city water admitted at the deaerator level to meet water needs.

Four boiler-feed pumps—two 120,000-lb-per-hr, 3600 rpm motor-driven, and two 60,000-lb-per-hr, 3600 rpm, one motor and one turbine-driven—are hooked up to pull water from the deaerator and introduce it to the boiler against boiler pressure. A differential pump control regulates pump output in conjunction with the boiler water-level control.

Carryover Control. Generating steam at the 690-psi pressure level and operating with a 20% city-water makeup makes a good water-treatment system a necessity. The problems of silica and carryover are particularly important. A successful system for control of these factors comes from a series of daily checks for various chemical concentrations in the boiler water followed up by an over-all supervision and advice by an outside water consultant. A specified amount of various chemicals as determined by these checks is added.

Control of carryover also receives help from the design of the boiler circulating system. The steam-water mix coming from the steaming tubes enters the steam-release drum above the water level. Releasing all generated steam in the open drum space of the main boiler drum above the water level prevents geysering and turbulence of the water body in the drum. Such a method, the designer feels, effects rapid separation of steam from water. Also, the separation is free and without disturbance.

Fan Loading. Before the 1939 plant change, a single stack employing only natural draft proved ample for operation of the underfeed stoker-fired boilers. When the 1939 plant expansion went into effect a single stack design was followed for handling all flue gas from the pulverized-coal and stoker-fired boilers. But it was necessary to add a separate induced-draft fan to serve the stoker units in addition to the fans called for in the design of the then new pulverized-coal-fired boilers. A mechanical dust collector was also placed in the flue-gas circuit, which added further to fan loading.

The 50,000-lb-per-hr boiler addition uses the already existing steel stack. This stack, together with induced- and forced-draft fans, is set up just outside the power plant building. The fans have a special outdoor housing for protection against the weather.

As in the older units, a mechanical dust collector has been connected into the new boiler exit flue-gas path. This unit consists of a series of 6-in.-dia tubular cyclone dust collectors. These individual tubular collectors have a single inlet, comparatively narrow, with inlet height approximately ten times width of opening. Tube inlet and diameter are proportioned so as not to effect any change in gas velocity. Such a velocity change between tube entrance and the precipitating portion of the tube could quite readily set up an erosive action.

The particular tube in service at this plant has a lower capacity than the standard design but a higher degree of collection. The tubes operate on a flat collection efficiency curve with almost 100% collection of dust particles larger than 20 microns (approximately 675 mesh). Draft loss ranges between ½ in. and 4 in. wg.

Coal System. The new boiler fires in pulverized form a bituminous coal, ranging from 13,600 to 13,900 Btu per lb and having an ash-fusion temperature of 2750-2950 F. Combustion control operates from a compressed-air actuated system that regulates the coal to air ratio and rate of fuel feed for various steam loads.

Freight cars haul the coal in and it is unloaded to a plant coal-storage pile. From storage it is admitted to the coal-handling system for delivery to unit pulverizers for grinding.

Incoming coal to the pulverizer moves on a belt over a magnetic drum where all tramp metal is separated. From here coal falls to the pulverizer where it undergoes a combined impact and attrition form of pulverization.

A pulverizer fan mounts on the pulverizer shaft and from the fan chamber blows the coal and air mixture through pipes directly to the burners where it enters the furnace.

PRINCIPAL EQUIPMENT OF C STREET POWER PLANT

Norton Company, Worcester, Mass.

STEAM GENERATORS AND AUXILIARIES:

Boilers, two, 30,000 lb per hr, 728 psi, 750 F...	Riley Stoker Corp
Boiler, one, 50,000 lb per hr, 728 psi, 750 F....	
Burners, six, 2 per unit, pulverized coal.....	
Preheaters, 2, tubular, 3850 sq ft.....	
Preheater, 1, tubular, 50,000-lb unit.....	
Economizers, two, 30,000-lb units, 1080 sq ft...	
Pulverizers, three, 1 per unit.....	
Superheaters, two, 12 tubes, 30,000-lb units....	
Superheater, 1, suspended type.....	
Soot blowers, rotary and retractable	Diamond Power Spec Corp
Water columns	Reliance Gauge Column Co
Safety valves	Manning, Maxwell & Moore
Blowdown system, continuous	Hagan Corp
Blowoff valves	Yarnall-Waring Co
Traps, inverted bucket	Strong, Carlisle & Hammond Co
Dust collectors, 2, mechanical	Prat-Daniel Corp
Forced-draft fans, three, 1 per unit	B F Sturtevant Co
F-d-fan motors, two, 25 hp, 2-speed	Westinghouse Elec Corp
F-d-fan motors, one, 30 hp, 2-speed	Westinghouse Elec Corp
Induced-draft fans, 4	B F Sturtevant Co
1 per unit plus 1 added to old stoker units	
I-d-fan motors, two, 100 hp, 2-speed	Allis-Chalmers Mfg Co
I-d-fan motors, two, 75 hp, 2-speed	Allis-Chalmers Mfg Co
Ash-removal system	United Conveyor Corp
Combustion-control system	Hagan Corp

ELECTRIC GENERATORS AND AUXILIARIES:

Turbine-generator, one, 3125 kva, 3600 rpm	General Electric Co
0.8 pf, bleed at 120 psi, exhaust at 3 psi	
Turbine-generator, one, 500 kw, 3600 rpm	Allis-Chalmers Mfg Co
Electric switchboard	General Electric Co

WATER-TREATMENT SYSTEM AND AUXILIARIES:

Deaerator, one, 120,000 lb per hr	Worthington Pump & Machy Corp
Chemical pump, 1, automatic flush valve,	Worthington Pump & Machy Corp
Condensate return pumps, 4	Ingersoll-Rand Co
125 gpm, 3480 rpm, 80.8-ft head	

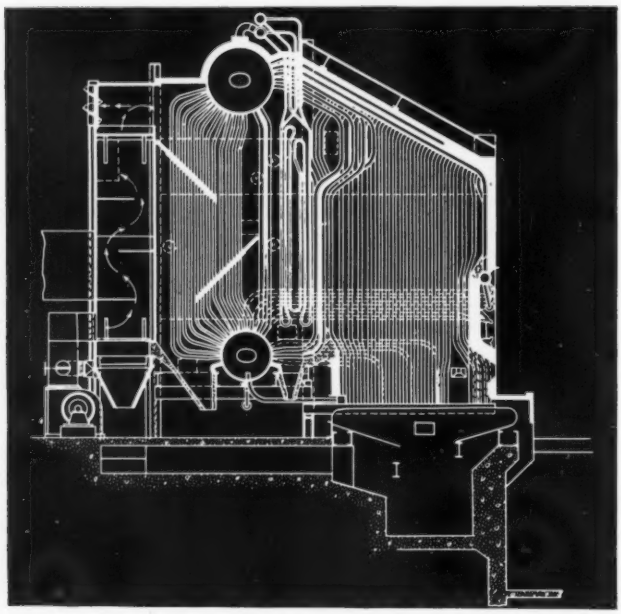
PRESSURE REDUCERS, CONTROLS, INSTRUMENTS:

Pressure reducers, 2, 3-in. valves	Mason-Neilan Regulator Co
Desuperheating stations, 2	Elliott Co
Desuperheater control	Mason-Neilan Regulator Co

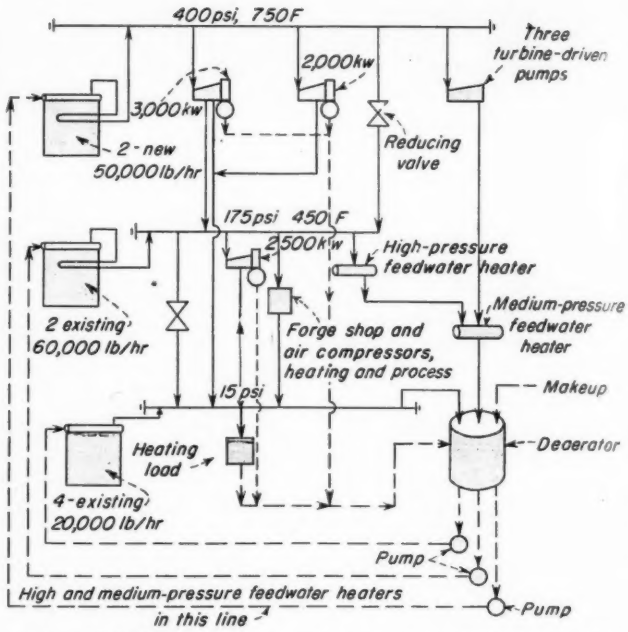
PUMPS AND COMPRESSORS:

Boiler feed, two, 1000-psi outlet	Ingersoll-Rand Co
3600 rpm, 120,000 lb per hr, motor driven	
Boiler feed, two, 1000-psi outlet	Ingersoll-Rand Co
3600 rpm, 60,000 lb per hr, 1 motor- and 1 turbine-driven	
Boiler-feed motors, two, 200 hp, 3600 rpm	Westinghouse Elec Corp
Boiler-feed motor, one, 125 hp, 3600 rpm	Westinghouse Elec Corp
Boiler-feed turbine, one, 125 hp	Terry Steam Turbine Co
Pressure regulators, 2	Northern Equipment Co
Differential pressure pump control	
Compressors, 2	Westinghouse Elec Corp
100 psi, standby for combination controls	
Combustion controls, water and steam flow	Bailey Meter Co
Recorders, boiler temp, steam and water	Bailey Meter Co
Gages, draft	Bailey Meter Co. / Hayes Corp Co
Gages, pressure	Ashcroft / Manning, Maxwell & Moore, Inc

CONSULTING ENGINEER | Sill & Warrington



TWO NEW STEAM GENERATORS of 50,000-lb-per-hr capacity add the needed steam at a pressure level that permits economies



LOAD CHANGES resulting from seasonal variations are fitted into this steamflow pattern by proper adjustment of the flow

PULLMAN STANDARD CAR

Better operating economy plus additional steaming capacity results from a combined power expansion and modernization program carried out at this manufacturer's Chicago plant

▶ THE 110TH STREET, Chicago plant of the Pullman Standard Car Manufacturing Co had in 1945 the following major equipment in its power house:

(1) two 175-psig 450-F 60,000-lb-per-hr steam generators

(2) four 15-psig saturated 20,000-lb-per-hr steam generators

(3) one 2000-kw turbine-generator operating with throttle conditions of 175 psi, 450 F; 5-psi extraction or induction; 27 in. vacuum

(4) one mixed-pressure turbine-generator of 2500-kw capacity with throttle conditions of 175 psi, 450 F; 2.5-psi induction; exhausting to 27-in. vacuum

(5) two 1500-kw turbine-generators operating with throttle conditions of 175-psi 450-F exhausting to 27-in.

Modernization. This lineup of equipment could no longer meet growing plant needs. Additional steaming capacity and also additional electric-generating capacity became highly important. To provide this needed additional capacity and at the same time give a better over-all operating economy a plan for modernizing and expanding power was put under way.

Major steps in this modernization program involved:

(1) installing two new 50,000-lb-per-hr steam generators to deliver steam at 425 psi and 750 F.

(2) removing one of the 1500-kw turbine-generators and installing in its place a 3000-kw turbine designed to take steam at 400 psi and 750 F with provision for extraction at 175 and 5 psig

(3) making certain necessary alterations in the 2000-kw turbine for operation with 400-psi 750-F steam

(4) installing a new 300,000-lb-per-hr deaerating heater, new boiler-feed pumps and other auxiliary equipment

(5) setting up the required switchgear and electric substations

(6) fitting all old and new equipment into a well-engineered and completely integrated plant so expected operating economies could be realized.

Boiler Units. The two new steam generators, rated at 50,000 lb per hr, have a heat release of 22,000 Btu per cu ft per hr, a total heating surface of 7870 sq ft and a furnace volume of 3000 cu ft. There is no economizer but a 4050-sq-ft tubular air heater has been supplied.

Circulating system of these boilers includes a radiant waterwall section in the furnace and a cross-baffled convection section, built around two main drums. Upper or steam-release drum has a 54-in. inside diameter and the lower or mud drum has 42-in. inside diameter. A pendant superheater of 3500 sq ft raises steam temperature.

Steam Distribution. Steam from the two new boilers enters a header at 400 psig and 750 F. The quantity of steam they deliver varies with the season. For summer conditions steam load at this level averages about 98,200 lb per hr, and for winter with the plant heating load added, 120,000 lb per hr.

Coming off this 400-psi header, shown in flow diagram above, are (1) two condensing-turbine-generators (2) boiler-feed pumps (3) a pressure-reducing station. The 3000-kw machine carries base load. Its summer throttle flow is 94,150 lb per hr, and of this, 74,290 lb per hr are bled off at 175 psig. Remaining 19,860 lb per hr return to the deaerating heater from the condenser. In winter, as in summer, both the 3000- and 2000-kw machines carry full

load. The 3000-kw unit takes 53,500 lb per hr. It delivers 51,000 lb to the 15-psi bleed point and 2500 to the deaerator as condensate. The 2000-kw unit receives 31,500 lb per hr at the throttle; delivers 20,000 lb through the 15-psi bleed point, returns 11,500 lb to deaerator as condensate.

The boiler-feed pumps operating from the 400-psi level use 4050 lb per hr in summer and 4610 lb per hr in winter. In both cases all steam exhausts to the medium-pressure closed feedwater heater in the feed line to the new boilers.

Last major element off the 400-psi header, the pressure-reducing station, handles no steam under summer operating conditions, but 30,390 lb per hr during the winter.

Intermediate Pressure. Next pressure level, the 175-psig 450-F header, has connections for steam from (1) two 60,000-lb-per-hr existing steam generators (2) the pressure-reducing station from 400-psi header (3) bleed from the 3000-kw turbine-generator.

Summer and winter steam distribution differs. Summer load is such that no steam enters the 175-psi header from the 60,000-lb older boilers nor from the main pressure-reducing station between the 400- and 175-psi levels. All steam comes from the 175-psi bleed point of the 3000-kw unit. Winter loading brings about a different balance. The 3000-kw high-pressure turbine supplies no steam to this header at all. The older boiler units deliver rated capacity, 120,000 lb per hr, and add to the 30,390 lb coming through the pressure-reducing station.

The various elements depending upon the 175-psi header for steam, see flow diagram above, are: (1) a 2500-kw turbine-generator (2) a high-pressure closed feedwater heater (3) a pressure-reducing valve connecting to the 15-psi system (4) air compressors in the plant, shop special heating and process, forge-shop uses.

In summer, 9230 lb per hr of the 74,290 lb coming off the bleed point of the high-pressure 3000-kw turbine go to the closed high-pressure feedwater heater with exhaust passing on to the medium-pressure feedwater heater. The 2500-kw turbine-generator takes 17,170 lb per hr of this supply to generate 2000 kw. Together with 15-psi steam entering at a later stage the 2500-kw unit passes all steam through a condenser and back to the deaerator. All the rest of the 175-psi steam, 55,000 lb per hr, goes to the forge shop and air compressors.

Winter load produces the following rearrangement of steam flow at the 175-psi level. The 120,000 lb per hr developed by the older boilers supplying this header and the 30,390 lb from the reducing valve divide up this way: The high-pressure closed feedwater heater takes 12,410 lb per hr; 55,000 goes to the forge shop and air compressors and the remainder passes through the reducing valve to meet the heating load.

Low-Pressure System. The only remaining operating steam system is a 15-psi one. It has four 20,000-lb-per-hr boilers built to generate steam at this pressure. In addition, it connects with (1) the 175-psi steam through a pressure-reducing valve (2) three turbines, the 3000, 2500 and 2000-kw units (3) extraction, forge shop uses and air compressors.

Operating economy dictates the following balance. For summer, all steam entering the 15-psi system comes from the exhaust of air compressors and forge-shop uses. This steam goes (1) to meet the process heating load, 11,000 lb per hr, (2) to enter at the later stages (27,530 lb per hr) of the 2500-kw turbine-generator, and (3) to raise the temperature in the deaerator, 10,970 lb per hr.

Winter loading produces this distribution. The 15-psi boilers develop 76,710 lb per hr of steam. To this is added 82,980 lb per hr from the pressure-reducing valve operating off the 175-psi header and a total of 71,000 lb per hr from the 3000-kw and 2000-kw turbine-generators. Exhaust system from compressors and forge shop supply another 55,000 lb per hr.

The various users of steam from the 15-psi system handle available steam in this proportion: 32,930 lb per hr go to the deaerator to raise its temperature; the plant heating load for winter needs amounts to 252,700 lb per hr.

Condensate from this heating load joins with the 14,000 lb per hr coming from the condensers of the 3000-kw and 2000-kw turbine-generators when carrying full load. The 2500-kw 175-psi turbine-generator under normal winter operation carries no load.

Water Cycle. All condensate returns, plus the exhaust from the medium-pressure closed feedwater heater, meet with the makeup at a 300,000-lb-per-hr deaerator. Some steam from the 15-psi system goes to raise the deaerator temperature. A series of two different-size and pressure pumps deliver water from the deaerator to (1) the new 50,000-lb-per-hr high-pressure boilers (2) the two existing boilers supplying steam at 175 psi, and (3) the four boilers delivering 15-psi steam.

PRINCIPAL NEW EQUIPMENT OF POWER PLANT

Pullman Standard Car Manufacturing Co, Chicago, Ill.

STEAM GENERATORS AND AUXILIARIES:

Boilers, two, 425 psi, 750 F. 2-drum bent-tube, waterwalls, 50,000 lb per hr
Superheaters, 2, one per unit
Air heaters, 2, one per unit
— Wm Bros Boiler & Mfg Co

Soot blowers, air puff — Diamond Power Specialty Co
Coal handling — W A Melchior
Ash handling — United Conveyor Corp
Spreader stokers, 2 — Detroit Stoker Co
Roto-grate, 12 ft 1½ in. wide x 11 ft 8 in., 3 feeders
Combustion control — Leeds & Northrup Co
Induced-draft fans — Clarage Fan Co
Forced-draft fans — Clarage Fan Co
Flowmeters — Republic Flow Meters Co

WATER-TREATMENT SYSTEM AND AUXILIARIES:

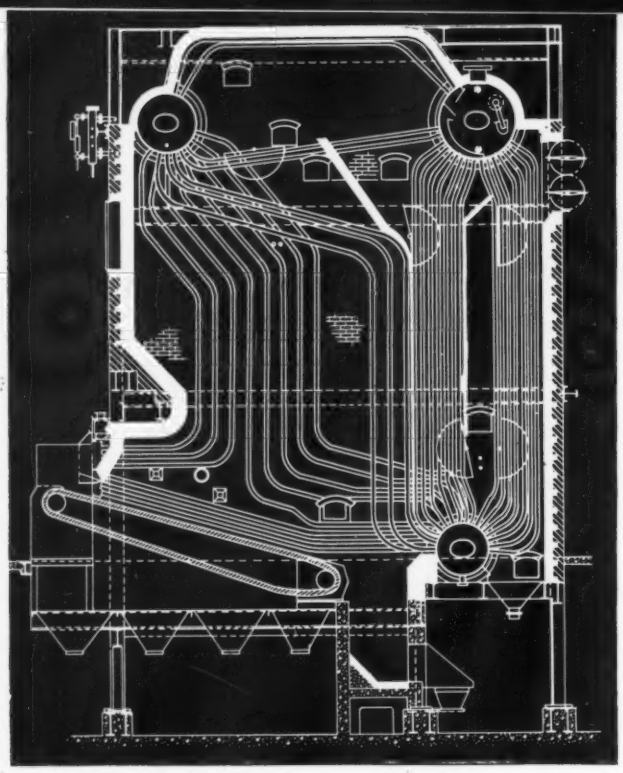
Deaerator, 1 — Worthington Pump and Machy Corp
300,000 lb per hr, 6 ft 6 in. dia x 13 ft 3 in. plus storage section, 9 ft x 13 ft 3 in.

Feedwater regulators — Northern Equipment Co
Feedwater heaters, 2 — Alberger Heater Co
515 sq ft, 125,000 lb per hr, each from 220 to 370 F; steam pressures 40 and 175 psi, respectively
Boiler feed pumps, 3 — Ingersoll-Rand Co
Turbine-driven, 6-stage centrifugal pumps, 125 gpm, 1082-ft total head

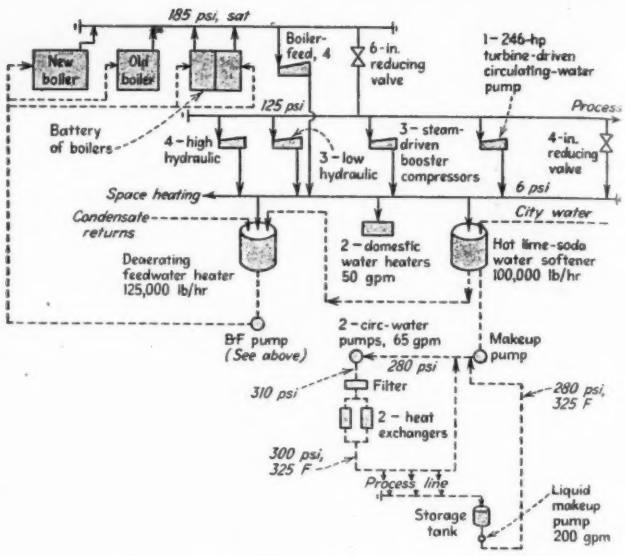
ELECTRIC GENERATORS AND AUXILIARIES:

Turbine-generator, one, 3000 kw — General Electric Co
0.8 pf, extraction at 175- and 5-psig, throttle conditions; 400 psi, 750 F
Condenser, 2-pass — Allis-Chalmers Mfg Co
3750 sq ft effective cooling surface
Switchgear, low voltage — Allis-Chalmers Mfg Co
For six-750-kva indoor substations
Unit substations, 6 — Allis-Chalmers Mfg Co
Includes main 1200-amp, 50,000-amp interrupting capacity air circuit breakers, one per station; 400-amp, 25,000-amp interrupting-capacity feeder breakers, 3 per station

CONSULTING ENGINEERS — Laramore & Douglass, Inc



NEW STEAM GENERATOR designed for 475 psi gives needed extra process capacity; will permit future generation of power



PROCESS NEEDS vary widely in a heavy industrial plant, requiring that power plant furnish ample steam, air and water

MANSFIELD TIRE

Even though the vital rubber industry had its plant-production capacity increased wherever possible throughout the past war, it still falls short of demand. Here's a prominent Ohio tire concern that is revamping power facilities for higher output

► POWER-PLANT SERVICES of a tire-manufacturing concern like the Mansfield Tire and Rubber Co, Mansfield, Ohio, include steam, water, air and electricity. Mansfield does not, however, generate its own electrical energy. But plant process needs keep growing and as one step in keeping ahead of this growth a new 90,000-lb-per-hr steam generator has been installed. It is designed for 475-psi operation although at present it develops steam at process pressure, 185 psi.

Pressure Selection. The selection of a higher pressure design was prompted by the fact that a turbine-generator unit to operate from design pressure, 475 psi, and exhaust to one of the process pressure levels, 185, 125 or 6 psi, could be put in at some later date without affecting boiler-room operation. This move plus the addition of a pressure-reducing station could increase the services from the power plant and yet insure adequate quantities of process steam no matter how the electrical energy demands would vary.

This 90,000-lb-per-hr unit is of 3-drum, bent-tube design employing waterwalls and convection surfaces in its circulating system. A series of waterwall tubes run along the furnace sides at the grate level to provide the necessary cooling in this area for reducing clinkering. There is no superheater at present but space has been provided for later installation.

Incoming feedwater for the new boiler enters the upper rear drum (see above cross section) from which it passes to the boiler circulating system. This same drum contains various entrainment baffles for removing moisture in steam before it enters the plant distribution system.

Stoker. A compensating-feed stoker fires the new boiler. The entire stoker assembly sets in the furnace at an angle, sloping from front to back. Constant travel of the grate gives continuous ash discharge. Air for combustion passes through openings in the grate area and meets with a stream of secondary overfire air introduced below the ignition arch by a blower nozzle. This meeting of air streams issuing from different directions helps produce an overfire mixing and turbulent action. Into this same zone, but from the side of the furnace and farther back on the grate travel, is the cinder-reinjection nozzle. It admits into the furnace area all collected siftings from the stoker, and cinders from the bottom of the first pass.

Compensating Feed. The stoker bed itself is of the compensating-feed design. Grate surface is made up of alternately moving and stationary sections that run the full length of the stoker. The moving part occupies the greater area. Over the grate surface at the rear of the furnace are cover plates. These plates (1) retard ash flow to give a good clean grate surface for the moving elements passing under the covers (2) effect a tight rear-end draft seal.

Coal entering the furnaces comes in on the moving grate sections and is levelled off by a feed gate to the de-

PRINCIPAL NEW POWER-PLANT EQUIPMENT

Mansfield Tire & Rubber Co, Mansfield, Ohio

STEAM GENERATORS AND AUXILIARIES:

Boiler, one, 90,000 lb per hr.....Henry Vogt Machine Co
475-psi design, stoker-fired, cinder return
Soot blowers.....Bayer Co
Weigh larry, 1-ton capacity.....Beaumont-Birch Co
Silo, 90-ton, steel.....Beaumont Birch Co
Ash-removal system.....United Conveyor Corp
Continuous-blowdown system.....Henry Vogt Machine Co
Blowdown valves.....Yarnall-Waring Co
Safety valves.....Manning, Maxwell & Moore, Inc
Nonreturn valves.....Crane Co
Water gages and water columns.....Reliance Gauge Column Co
Combustion control and flowmeters.....Republic Flow Meters Co
Pressure gages.....Manning, Maxwell & Moore, Inc
Traps.....W H Nicholson Co, Inc
Stokers, 1, traveling grate, Stowe.....Johnston & Jennings Co
Cinder-reinjection system.....United Conveyor Corp
Overfire-air fan, 1.....Clarage Fan Co
Supplies overfire-air nozzles
Furnace arch, suspended.....Laclede Christy Clay Products Co
Forced-draft-fan, dual drive.....Clarage Fan Co
F-d fan turbine.....Elliott Co
F-d fan couplings, 2.....Ralston Co
F-d motor, 1, 25 hp.....General Electric Co
Chimney, concrete.....Rust Engineering Corp
225 ft high, 8-ft top dia

WATER-TREATMENT SYSTEM AND AUXILIARIES:

Deaerator, one, 125,000 lb per hr.....Cochrane Corp
Softener, 1, lime soda.....Cochrane Corp
Hot process, 100,000 lb per hr
Chemical feed pump.....Milton Roy Co
Chemical consultants.....W H & L D Betz Co

PUMPS AND COMPRESSORS:

Boiler feed, 2.....Ingersoll-Rand Co
Deliver 240 gpm at 475 psi
Boiler-feed turbine, 115 hp, 3600 rpm.....Elliott Co
Water regulator, 1.....Northern Equipment Co
Condensate-return pumps.....C A Dunham Co
Piping.....Crane Co
Pipe covering.....Johns-Manville Co
Compressors, two, 100 psi.....Bury Compressor Co
1 at 1550 cfm, 1 at 1450 cfm, motor-driven
Compressors, three, 100 psi.....Ingersoll-Rand Co
2 at 450 cfm, 1 at 900 cfm, motor-driven
Compressor, one, 100 psi.....Sullivan Div, Joy Mfg Co
790 cfm, motor-driven
Compressors, two, 250 psi.....Ingersoll-Rand Co
1 at 450 cfm, 1 at 233 cfm
Compressor motors, 6 { 3.....Ideal Electric Mfg Co; 2.....General Electric Co; 1.....Westinghouse Elec Corp
Compressor controls { Cutler-Hammer Inc; Clark Controller Co

CIRCULATING-WATER SYSTEM:

Pumps, two, 185-ft head.....Manistee Co
1 at 2200 gpm, 1 at 1500 gpm
Pump, one, 185-ft head, motor-drive, 1700 gpm.....Ingersoll-Rand Co
Pump, one, 185-ft head, motor-drive, 500 gpm.....Manistee Co
Pump, one, 231-ft head, turbine-drive, 3500 gpm.....Fredericks Co
Turbine-drive, 1.....Murray Iron Works
Pump motors { 2.....General Electric Co; 1.....Ideal Electric Mfg Co; 1.....Westinghouse Elec Corp
Hydraulic pump, one, 350 psi.....Dean Bros Pump Co
Duplex, outside packing, 16x8x18
Hydraulic pump, one, 350 psi.....Warren Pump Co
Duplex, outside packing, 14x5½x12
Hydraulic pumps, 1750 psi { one, 16x2¾x12.....Worthington Pump; one, 16x3x12.....Dean Bros Pumps Inc; two 12x2½x12.....Warren Pump Co
Heat exchanger, 1.....Henry Vogt Machine Co
Filter, circulating water.....Cuno Engrg Corp
Circulating-water meters.....Brown Instrument Co

sired fuel-bed thickness. As the coal progresses it spills over on the stationary elements which tends to slow up fuel-bed movement and build up a compression force. When cracks and fissures develop this compression relieves itself by dumping coal into the open areas from the slower moving fuel piled up on the stationary grate.

Furnace setting for this type of stoker differs somewhat from the usual long low-hanging rear arch and narrow throat (see boiler cross section). The ignition arch, however, is retained. It provides the necessary heat-storage area for promoting early ignition.

Steam Cycle. The steam output from this 90,000-lb-per-hr unit joins that produced by three older boilers, one with a multiple-retort underfeed stoker and the others, stoker-fired units in battery. All this steam enters a 185-psi saturated-steam header. A new turbine-driven boiler-feed pump designed for 475-psi at the throttle is now operating with 185-psi steam. The only other takeoff from this header is a 6 in. reducing valve that delivers steam at 125 psi.

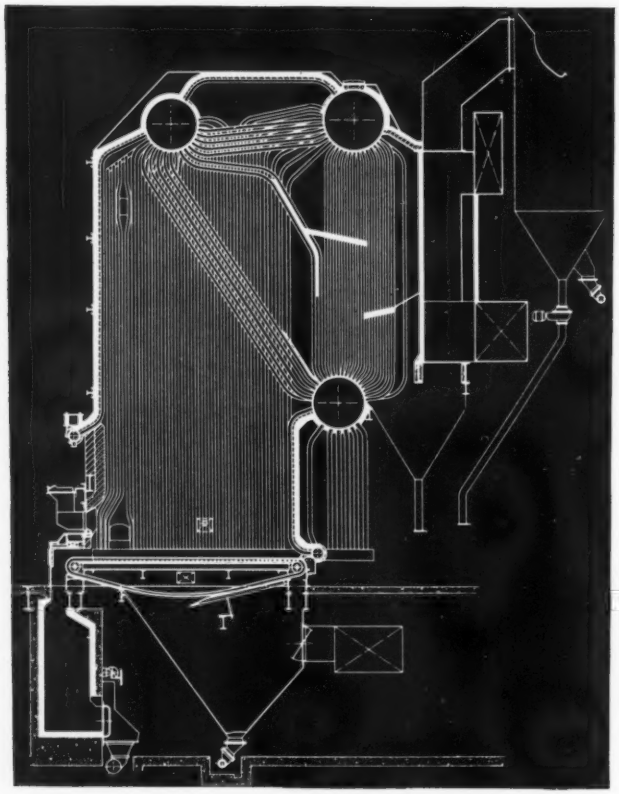
The 125-psi header supplies steam for (1) process (2) a 4 in. reducing valve (3) a 246-hp turbine-driven circulating-water pump (4) three steam-driven booster air compressors (5) three low-pressure hydraulic pumps (6) three high-pressure hydraulic pumps. All steam except that going to process goes to 6-psi header.

This last-named header ties into the plant space-heating system. A small amount of it is used for two 50-gpm heaters supplying water for shower-room purposes. In addition, steam for the hot-process water softener and the deaerator comes from this 6-psi supply.

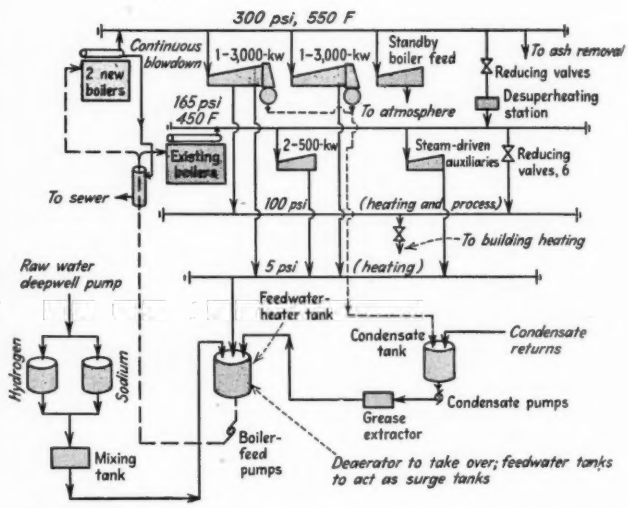
Water Cycle. All water for process and steam makeup comes from city water mains. It enters a hot lime-soda water softener of 100,000-lb-per-hr capacity. From here it continues to a 125,000-lb-per-hr deaerating feedwater heater. At this point it joins with all condensate returns to enter the boiler-water cycle. Boiler-feed pumps, both turbine-driven and motor-driven, deliver water to the boilers. A proportioning chemical-feed pump supplies treatment chemicals to the drums. The new unit has a continuous blowdown system for keeping boiler water concentration within allowable limits. The older units are given periodic blowdowns.

Process Water. Water needs for process are considerable. Control and delivery of this water impose a heavy burden on power-plant operation. One such process-water service shows on the flow diagram, p 110. Water leaving the hot lime-soda water softener goes through a makeup pump into a closed process-water cycle. This water, at 280 psi, enters two 65-gpm circulating-water pumps. It then passes through a filter, at 310 psi, into a pair of heat exchangers, parallel-connected. Pressure drop through these heaters amounts to about 10 psi. Water at 300 psi enters a process-water header for service. Discharge water collects in a storage tank. A liquid makeup pump holds storage at a fixed level by returning excess water to the cycle at 280 psi for recirculation.

In much the same way plant demands for considerable quantities of compressed air are made a part of power-plant operation. A battery of compressors detailed in the equipment table above shows the extent of this air service. There are two main pressure levels —250 and 100 psi—at which compressed air is delivered throughout the plant for various uses.



COMPLETELY NEW power plant houses two 125,000-lb-per-hr, 300-psi, 550-F steam-generating units fired by spreader stokers



HOOKUP shows how new steam plant connects to existing plant across river. Old plant houses turbines, low-pressure boilers

MICHIGAN STATE COLLEGE

Heavy influx of returning GI's in American universities and colleges has taxed all facilities and set off a large-scale building and plant-expansion program on the campuses

▶ ONE THING all universities and colleges hold in common today is a crying need for more plant to house and handle the students seeking admission. Michigan State College at East Lansing, Mich. is taking steps to meet this need by a heavy building program. And as part of the program they have completed an entirely new steam plant located across the river from the existing one.

This steam plant is housed in a most attractive building and will enhance any eventual development growing around it. Two 125,000-lb-per-hr steam generators deliver steam at a new high pressure level, 300 psi, 550 F, to a header connecting with the old plant across the river. These steam generators have a total heating surface of 13,000 sq ft, a furnace volume of 4,760 cu ft and a tubular air heater of 7,200 cu ft.

Spreader Stokers. Each unit is fired by a traveling-grate spreader stoker with four feeders which is called on to handle a fairly wide range of coals. With the selected design the grates move forward slowly and continuously discharge ash at the front. Incoming coal enters in the reverse direction, being thrown from front to back. This reverse firing method effectively lengthens available combustion time and helps in achieving complete combustion.

A series of revolving rotors feed coal from the hoppers mounted at the front of the steam generators and throw it into the furnaces. These overthrow rotors have special blades for getting a uniform distribution of coal across the furnace area. In addition a spill plate at the front of the rotor assembly permits changing fuel distribution for a different size of coal. When the spill plate moves forward the rotor plate throws more of the fuel toward the rear of the furnace and produces the opposite effect when moved backwards. The fine particles of coal are caught up and burn in suspension while the coarser particles, being heavier, fall to the forward-moving grate for normal stoker combustion. The grates are built with many small openings to admit air for combustion at high velocity and with a uniform distribution.

Since the grate is a traveling one and has a continuous cleaning feature preheated air can be passed through the grate without producing any overheat-

ing difficulties. Air from this undergrate source mixes with an overfire air stream admitted at high velocity; good turbulence results. All fines collected from the boiler, are reinjected through a system of blower nozzles at a point located above the grate for further burning.

Rate of coal feed can be varied and grate speed is linked with it. Grates operate through a variable-speed transmission and gear reduction unit, consisting of two sets of fully enclosed, machine-cut worms and gears mounted in roller bearings.

Coal Supply. The coal is delivered by freight cars and unloaded to a conveyor system for delivery to an overhead bunker. A Redler conveyor lifts coal from its unloading point to a Redler system running along the length of the overhead bunker. From this overhead bunker coal enters a special distributing system designed to avoid segregation. The coal scales are built into this distribution system and special non-segregating spouts direct the coal to the individual furnace hoppers.

Ash Removal. A complete pneumatically operated ash-removal system has been set up. It collects ash from the furnace hoppers and flyash settled out in collecting hoppers under various boiler passes. A large tile ash-storage tank receives all discharge from the ash-removal system. A mechanical dust collector on the flue-gas outlet removes objectionable dust particles.

Steam Cycle. The steam output from these new 300-psi boilers passes into a header. Off this header in the power plant itself comes steam for a standby boiler-feed pump and steam for the ash-removal system. Most of the 300-psi steam enters the line connecting to the old plant.

Here the high-pressure steam passes through two 3000-kw condensing turbine-generators, one with extraction at 5 psi and the second a double-extraction unit bleeding at 100 and 5 psi. A 150,000-lb-per-hr pressure-reducing and desuperheating station in parallel with the turbines delivers steam to a 165-psi 450-F main.

This 165-psi main receives steam from existing boilers in the old plant. It is the main distribution header for the college steam cycle. From it steam is drawn for (1) two 500-kw turbine-generators, (2) steam-driven auxiliaries in the old power plant (3) six reducing valves for supplying steam to campus buildings for heating and occasional laboratory and building-steam equipment.

A still lower pressure steam system exists. It operates at 5 psi and serves heating needs in nearby areas. Into it comes the bleed from the two 3000-kw high-pressure turbine-generators, exhaust from two 500-kw medium-pressure units, also the steam-driven auxiliaries. In addition to its service as a heating main, some stream comes from the 5-psi line to raise the temperature of two open feed-water heater tanks. These tanks will soon be relegated to service as surge tanks for a 250,000-lb-per-hr deaerating heater which is about ready to take over.

Water Cycle. All condensate returns collect in a condensate-storage tank. From this point they are pumped through a grease extractor and then to the feedwater heater. Raw water for makeup purposes is drawn from underground by deepwell pumps and led to a set of water softeners; two are hydrogen-zeolite and three sodium. A new 170-gpm hydrogen-zeolite unit is planned for early installation.

Next step in the raw water preparation for makeup service is a mixing tank. This proportions the output from the sodium and hydrogen softeners to give the desired water mixture. The water is then introduced at the open feedwater heater.

Additional water treatment consists of an injection system using two proportioning pumps to introduce needed chemicals into the boiler drums. A continuous blowdown system regulates concentration of solids in boiler water.

PRINCIPAL POWER-PLANT EQUIPMENT, NEW STATION

Michigan State College, East Lansing, Mich.

STEAM GENERATORS AND AUXILIARIES:

Boilers, two, 11,000 lb per hr, 300 psi, 550 F, spreader stoker	Wickes Boiler Co
Air heaters, 2, tubular	Wickes Boiler Co
Superheaters, bare tube, return bend	Foster Wheeler Corp
Soot blowers	Diamond Power Specialty Corp
Coal conveyors	Stephens-Adamson Mfg Co
Coal spouts and coal scales	Stock Engineering Co
Ash-removal system	United Conveyor Co
Dust collector, mechanical	Western Precipitation Co
Continuous blowdown system	Permutit Co
Blowdown valves, OS and Y; safety valves; nonreturn valves	Edward Valves Inc
Water gages	Yarnall-Waring Co
Water columns	Reliance Gauge Column Co
Combustion control	Bailey Meter Co
Flowmeters	Bailey Meter Co; Hays Corp
Stokers, 2, spreader type, 4 feeders, motor-driven	Detroit Stoker Co
Stoker drive, PIV	Link-Belt Co
Cinder-reinjection system	Detroit Stoker Co
Reinjection-system blowers	American Blower Co; Buffalo Forge Co
Forced-draft fan, damper control	Clarage Fan Co
F-d fan motor, 2-speed	General Electric Co
Induced-draft fan, vane control	Clarage Fan Co
I-d fan motor, 2-speed, 200/50 hr	General Electric Co

WATER-TREATMENT SYSTEM AND AUXILIARIES:

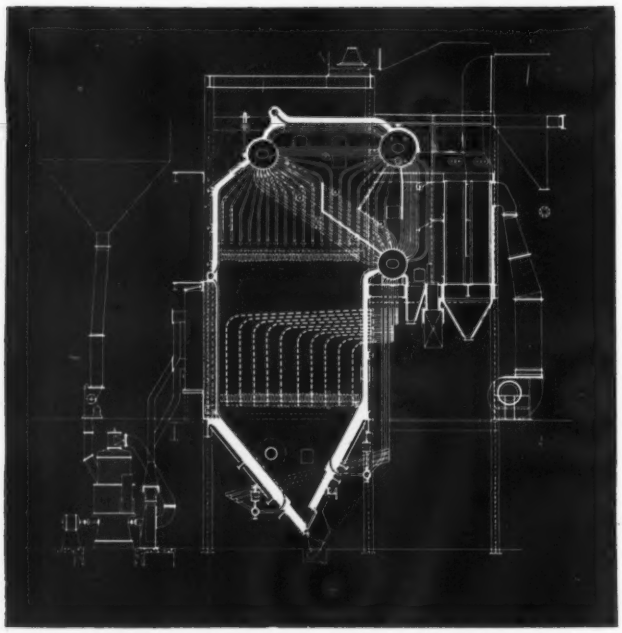
Deaerator, one, 250,000 lb per hr	Permutit Co
Softeners: 2, hydrogen; 3, sodium	Graver Tank & Mfg Co
Softeners, 1, hydrogen, 170 gpm average	Liquid Conditioning Corp
Chemical-feed pumps, 2	Hills-McCanna Co
Chemical-injection system	Hagan Corp
Water consultants	Hall Laboratories

PUMPS:

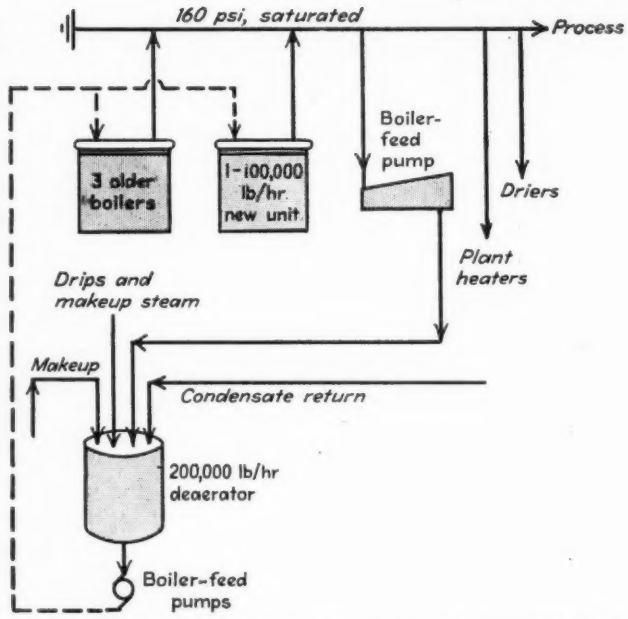
Boiler-feed pumps, 2, 117 gpm, motor drive	De Laval Steam Turbine Co
Boiler-feed motors	General Electric Co
Boiler-feed pump, 1, dual drive, 234 gpm	De Laval Steam Turbine Co
Boiler-feed turbine, 1	De Laval Steam Turbine Co
Boiler-feed pump, 1, motor drive, 234 gpm	De Laval Steam Turbine Co
Water regulator	Northern Equipment Co
Condensate returns	American-Marsh Pumps, Inc
Underground piping	Ric-Wil Co
General piping and fittings	Tube Turns Co Inc; Midwest Piping & Supply Co
Pipe covering	Union Asbestos & Rubber Co
Expansion joints	Yarnall-Waring Co
Traps, steam	Yarnall-Waring Co

TURBINE GENERATOR AND REDUCING STATION:

Turbine-generator, 1, double extraction, 3600 rpm, 3000 kw at 0.8 pf, air cooled	General Electric Co
Condenser, 1, 3000 sq ft, 28 in. vacuum	C H Wheeler Co
Pressure-reducing station, 1, 150,000 lb per hr, 300 psi	Northern Equipment Co
Desuperheater, one, 300-150 psi	Northern Equipment Co
Switchgear and switchboard	General Electric Co
Desuperheater pump, motor-driven	Ingersoll-Rand Co
Desuperheater-pump motor	General Electric Co
CONSULTING ENGINEER	Claud R Erickson



PULVERIZED-COAL dry-bottom design distinguishes this large-capacity, relatively low-operating pressure 150-psi boiler



PLANT STEAM NEEDS cover only process and general heating, yet demand is so high that it justifies a large-capacity unit

CARBORUNDUM CO

Process and heating demands alone made this industrial concern almost double available steaming capacity for its Niagara Falls, N. Y. plant

► RIGHT AFTER the close of the war the Carborundum Co launched a plant expansion and modernization program at their Niagara Falls, N. Y. property. Along with this expansion program steps had to be taken to prepare the power-service facilities for the changes plant production would experience. Steam at the Niagara Falls plant is used almost entirely for heating, and in some process work, principally for driers. No steam at all goes for power generation except that portion used for turbine-driven boiler-feed pumps in the power plant itself.

Existing Plant. Before the expansion program reached the power plant the steam-generating capacity, at 300% rating, was 144,000 lb per hr. The three pulverized-coal-fired bent-tube boilers were fitted with feedwater regulators and combustion control. These units had forced-draft fans and induced-draft fans discharging into a breeching connecting to a single brick chimney 9 ft 6 in. in diameter and 200 ft high. Induced-draft fans were not used at ratings below 180%; for the higher draft losses at ratings above that point, the fans were cut in. No auxiliary surface in the form of economizers or air heaters was provided, and no flyash-collection equipment was installed. Ash handling was completely unmechanized; ash was removed from the dry-bottom hoppers, loaded into buggies and carted away.

Water Treatment. Water treatment employed zeolite softeners with a sodium-phosphate and sulphuric-acid treatment followed up by a degasifier. Makeup water plus all condensate returns passed through a deaerating feedwater heater before being pumped into the boilers. Exhaust steam from the boiler-feed-pump turbine drives and drips, supplemented by makeup steam as necessary, was used to heat the feedwater.

A careful study of the existing plant load, at the time expansion was planned, indicated that under peak heating conditions all three boilers had to generate steam at full capacity. With the extra steam demands that expansion would bring, an estimated additional 50,000 lb per hr of steaming capacity would be needed. To meet just this 50,000 lb per hr increase would still leave the plant without a spare boiler. The final decision thus was to increase capacity by 100,000 lb per hr, roughly equivalent to two of the boilers in the existing power plant. A further study of comparative boiler efficiencies, required boiler-room space, costs of installation and operation led to the selection of a single unit of 100,000-lb-per-hr capacity.

Steam Generators. The selected steam generator (see section above) has a total heating surface of 12,750 sq ft, a furnace volume of 6700 cu ft, a heat release of 18,000 Btu per cu ft per hr at normal loads, and is designed for 200 psi pressure. Actual operation, however, is at 150 psi, the pressure of the process header.

Pulverized coal fires the new unit. Two bowl mills with 75-hp motor drives act as pulverizers. An 8850-sq-ft tubular air heater supplies preheated air

for use with the pulverized coal. Four burners fed by 8 in. fuel lines introduce the pulverized coal and air mixture to the furnace through nozzles.

In contrast to the older units, the recently installed boiler is equipped for full mechanical-draft operation, air preheating, pneumatic ash handling and flyash collection. The latter are mechanical separators consisting of a multiplicity of small-diameter high-efficiency cyclone tubes. They are designed to reduce flue dust in the gas leaving the steam-generating unit to a point well below any level that might be classed as a nuisance in any possible future smoke-abatement ordinance.

Boiler performance when unit delivers 100,000 lb per hr of steam at 150 psi and 366 F with feedwater at 212 F runs as follows: CO_2 leaving the furnace 15.5%; CO_2 leaving the air heater 14%; gas temperature leaving the boiler 537 F; gas temperature leaving the air heater 345 F; air temperature entering the air heater 80 F and leaving, 343 F. A total of 105,000 lb per hr of air is required and flue gas volume amounts to 117,000 lb per hr. Draft loss through the boiler amounts to 1.16 in. water and through the air heater 1.6 in.

Ash Conveying. The ash-handling equipment consists of a pneumatic-conveyor system including an ash-storage bin and an unloader. The main pneumatic section has an 8 in. line with branch lines connecting to hoppers (1) located at the bottom of the rear pass of the boiler (2) under the air heater (3) under the dust collector (4) at the base of the new radial brick stack.

The ash-collecting pneumatic lines dump all ash into a 15-ft dia by 27 ft, 4180-cu-ft vitrified-tile ash-storage bin. From this collection point a special device built to give dustless unloading permits emptying the storage bin for final disposal.

The entire ash-removal system, pneumatic lines, storage-bin branch feeders —has been designed large enough to serve the three older boilers as well as the older stack when future conversion and extension have been completed.

The new brick stack, 200 ft high and 9 ft 6 in. dia, is the same size as the existing one. It has ample capacity for the new 100,000-lb-per-hr steam generator as well as an additional unit if it should be needed at a future date.

Water Treatment. Feedwater treatment remains essentially the same as before except for re-arrangement to new locations. Incoming raw water goes through a sodium-zeolite softener. Sodium zeolite reduces water hardness to near zero. But this softened water runs high in sodium bicarbonates. Should this water be introduced directly to the boiler, free CO_2 and caustic soda formed would accelerate condensate-line corrosion and develop objectionably high alkalinity in the boiler water.

To avoid these difficulties the water treatment system at Carborundum employs a sulphuric-acid stage. The addition of this acid to the high sodium bicarbonate water from the softener produces these reactions: The sodium bicarbonate reacts with the sulphuric acid to form sodium sulphate plus free CO_2. To get the CO_2 out of the system a degasifier stage comes next.

This degasifier is a tower filled with trays. The water leaving the sulphuric-acid treatment enters the tower at the top and spills down over the trays liberating the free CO_2. A stream of air comes in at the bottom of the tower and rises upward in a counterflow arrangement to the downcoming water. This air stream mixes with the CO_2 and carries it off and out of the system.

Residual water is soft, low in sodium-carbonate alkalinity and highly suitable for boiler-feedwater purposes.

An additional feedwater heater, two boiler feed pumps and a complete new feedwater-piping system and main steam header were installed. The old plant had become cramped for room and a complete rearrangement of auxiliaries was required.

Coal Handling. The coal-handling system, consisting of track hoppers, feeders, elevators, conveyors and overhead coal bunkers, was rearranged and its capacity increased to suit the new enlarged plant.

One interesting sideline developing from the new power program revolves around the decision to place a sign between the two stacks, the new and the old, bearing the company name. That sign is 63 ft in length by 6 ft in height. It is suspended 150 ft in the air between the two 200-ft radial-brick chimneys. The truss is fabricated from special structural aluminum with a total weight of 6,000 lb.

PRINCIPAL NEW EQUIPMENT OF BUFFALO AVENUE POWER PLANT

Carborundum Co, Niagara Falls, N. Y.

STEAM GENERATORS AND AUXILIARIES:

Boiler, one, 100,000 lb per hr, 200 psi.....Erie City Iron Works
Pulverized-coal fired, 21,600 sq ft heating surface, 3-drum, waterwall furnace, 2½-in. tubes
Preheater, 1, tubular, 2-pass.....Erie City Iron Works
8850 sq ft heating surface, 1350 2½-in. tubes
Burners, 4, pulverized coal.....Combustion Engineering Co
Twelve ¾-in. nozzles and 8-in. fuel line
Pulverizers, 2, bowl mills.....Combustion Engineering Co
Size 16 feeder, 75 hp, motor driven
Soot blowers.....Diamond Power Specialty Corp
Coal conveyor.....Jeffrey Mfg Co
Safety valves.....J E Lonergan Co
Blowoff valves, duplex units.....Everlasting Valve Co
Combustion control.....Bailey Meter Co
Air-operated control of fuel feed, exhaust dampers, forced-draft and induced-draft dampers
Ash-handling equipment.....United Conveyor Corp
Pneumatic ash, flyash, dust conveyor plus a vitrified-tile storage bin, 15 ft dia x 27 ft high
Chimney and breeching.....International Chimney Corp
200 ft high, 9 ft 6 in. dia, tile
Dust collector, 1, mechanical.....Aerotec Corp
Forced-draft fan, one, 29,600 cfm, 40 hp.....Buffalo Forge Co
Induced-draft fan, one, 53,000 cfm, 122 hp.....Buffalo Forge Co

WATER-TREATMENT SYSTEM AND AUXILIARIES:

Water softeners, two, 4 ft 6 in. x 6 ft.....Permutit Co
Wood degasifier, 3 ft 6 in. x 19 ft, wood stave with acid feed
Deaerator, one, 200,000 lb per hr.....Cochrane Corp
Tank, 1, feedwater, hotwell, wood stave.....Arrow Tank Corp

PUMPS AND COMPRESSORS:

Boiler feed, one, 4-stage.....Buffalo Pumps Inc
4-in., 500-ft total head, 840 gpm, 150 hp
Boiler feed, one, 2 stage.....Buffalo Pumps Inc
4-in., 500-ft total head, 840 gpm,
Boiler-feed turbine, 1.....Terry Steam Turbine Co
142 bhp, 3500 rpm
Makeup-water pump, 1.....Buffalo Pumps Inc
6-in., 800 gpm, 160-ft head, 50 hp, motor driven
Pump pressure-control valve.....Swartwout Co
Expansion joints.....Yarnall Waring Co
Pipe covering.....Niagara Asbestos Co
Traps, steam.....Armstrong Machine Works
Meter equipment.....Bailey Meter Co
Motors.....Allis-Chalmers Mfg Co

CONSULTING ENGINEER.....C H Kremers & Son, Inc

1948 Design Survey of Typical Industrial and

For notes on uses and limitations of this tabulation • See page 122

Compiled by J C McCabe, Associate Editor

Company	Location	Consulting Engineers	First Operation, New Units	Nominal Pressure, psi	Nominal Steam Temperature, F	BOILERS				Furnace Volume, 1000 cu ft	Heat Release, 1000 Btu per cu ft per hr	Furnace bottom
						Number	Capacity, Each, 1000 lb per hr	Manufacturer	Heating surface, 1000 sq ft			
700 PSI AND ABOVE												
Standard Oil Co of Indiana	Whiting, Indiana	Stone & Webster	1948	1350	900	3	300	FW	21.6	30.8	13.7	DB
Dow Chemical Co	Midland, Mich	Dow Engrg	11-49	1250	830	2	400	BW	1.9	1.0	500.0[1]	ST
Scott Paper Co	Chester, Pa	Stone & Webster	11-47	975	825	1	170	CE	17.4	9.7	20.5	DB
Socony Vacuum Oil Co	Paulsboro, N. J		12-48	925	750	1	300	BW	....	16.5	....	DB
Calco Chemical Div	Willow Island, W. Va	Ebasco	1948	900	750	2	100	BW	9.6	5.7	23.0	DB
Monsanto Chemical Co	Everett, Mass		1949	900	825	1	100	RS	....	....	....	DB
Socony Vacuum Oil Co	Paulsboro, N. J	H A Kuljian	1948	900	750	2	125	CE	12.8	7.2	25.8	DB
Texas Co	Westville, N. J	Jackson & Moreland	1949	900	750	3	275	FW	22.3	11.9	30.0	DB
U S Navy Yard	Pensacola, Fla	H A Kuljian	1949	900	800	4	125	....	12.8	7.2	25.0	DB
Penna Salt Mfg Co	Wyandotte, Mich	Ford, Bacon & Davis	6-48	875	825	1	225	CE	....	15.4	17.5	DB
			10-48	....	....	....	....	....	....	....	....	....
			12-48	875	825	1	250	CE	....	15.4	19.6	DB
			4-49	....	....	....	....	....	....	....	....	....
Longview Fibre Co	Longview, Wash	R C Powell	12-48	840	750	1	230	BW	17.0	....	37.8	....
Chase Brass & Copper Co	Waterville, Conn		1-49	825	825	1	150	RS	36.8	10.6	18.1	DB
Longview Fibre Co	Longview, Wash	R C Powell	12-48	825	750	1	100	CE	18.4	....	....	....
General Aniline & Film	Rensselaer, N. Y	Baker & Spencer	12-48	765	700	2	125	CE	13.2	....	22.2	DB
Oxford Paper Co	Rumford, Me	C. T. Main	3-48	750	745	1	200	CE	20.7	16.3	18.0	DB
		H. S. Ferguson	3-48	750	725	1	84	CE	17.6	....	....	....
Monsanto Chemical Co	Springfield, Mass		1947	700	750	1	100	FW	8.0	4.4	27.8	....
Northern Paper Mills	Green Bay, Wisc		....	700	700	1	100	RS	9.7	5.9	20.0	DB
Textile Machine Wks	Wyomissing, Penna		1949	700	650	3	70	BW	6.9	3.9	22.0	DB
500 TO 699 PSI												
Norton Co	Worcester, Mass	Sill & Warrington	6-48	690	750	1	80	RS	15.1	3.7	18.0	DB
						2	50	RS	11.5	2.7	25.0	DB
Standard Oil Co of N. J	Linden, N. J	Standard Oil Development	3-49	685	750	1	265	BW	23.7	15.2	22.7	DB
R J Reynolds	Winston-Salem, N. C	J E Sirrene	12-48	675	750	1	200	CE	15.4	....	18.7	DB
River Raisin Paper Co	Monroe, Mich	Cummins & Barnard	1-48	675	750	1	180	Wi	19.5	....	27.3	DB
Tide Water Assoc Oil Co	Bayonne, N. J		2-48	670	750	1	100	BW	11.2	6.3	22.0	DB
Elliott Co	Jeannette, Penna		9-48	650	825	2	70	BW	6.8	3.9	....	DB
Hamersley Mfg Co	Garfield, N. J		2-48	650	700	1	80	BW	7.6	3.1	29.2	DB
			10-48	....	....	....	....	....	....	....	....	....
Lederle Laboratories	Pearl River, N. Y		....	650	750	1	80	RS	11.9	5.3	21.7	....
Monsanto Chemical Co	Monsanto, Ill		7-48	650	750	2	100	BW	11.5	5.0	26.0	DB
Shell Oil Co, Inc	Deer Park, Texas		9-48	650	750	4	250	BW	20.7	12.2	26.1	DB
Springs Cotton Mills	Grace, S. C	Robert & Co	5-48	650	750	2	150	BW	10.7	9.0	21.6	DB
Consolidated Paper Co	Shawinigan Falls, Que	H G Acres	1-49	630	750	1	150	CE	....	....	19.9	DB
Consolidated Paper Co	Three Rivers, Que	H G Acres	3-49	630	750	1	150	CE	....	....	19.9	DB
U S Industrial Chemicals	Baltimore, Md	Burns & Roe	....	630	700	1	240	CE	28.5	23.8	14.7	DB
Ecusta Paper Corp	Pisgah Forest, N. C	C T Main	....	625	750	2	80	RS	9.8	....	22.8	DB
Esso Standard Oil Co	Baltimore, Md	Standard Oil Development Co	6-48	625	750	....	....	....	....	....	....	....
Gardner-Richardson Co	Middletown, Ohio		1948	625	725	1	110	CE	14.3	7.4	20.0	DB
General Electric Co	Erie, Penna		11-48	625	825	1	100	CE	12.4	5.8	28.0	....
Ohio Oil Co	Robinson, Ill	A G McKee	11-48	625	750	2	100	CE	13.2	7.5	18.5	DB
Sherwin-Williams Co	Chicago, Ill	Schmidt, Gardner & Erickson	1-48	625	700	3	75	EM	7.8	3.7	30.2	DB
Ansco Film Div	Binghamton, N. Y	Baker & Spencer	9-47	600	750	3	50	CE	5.5	2.6	24.0	....
Carbide & Carbon Chem Corp	Texas City, Texas	Ford, Bacon & Davis	....	600	700	4	156	BW	....	....	....	DB
Corn Products Refining Co	Argo, Ill	Sargent & Lundy	4-49	600	750	2	250	BW	22.9	18.4	19.6	DB
El Paso Natural Gas Co	Oil Center, N. Mex		12-47	600	600	3	35	BW	5.9	....	33.2	DB
Glatfelter Co	Spring Grove, Penna	H M Wilson	3-48	600	640	1	115	RS	15.9	8.2	18.4	DB
Procter & Gamble Mfg	Kansas City, Kan	H K Ferguson	6-48	600	600	2	50	BW	7.0	1.5	44.6	....
S D Warren Co	Cumberland Mills, Me	Sill & Warrington	8-48	600	750	2	160	CE	12.4	13.0	15.0	DB
West Virginia Pulp & Paper	Covington, Va		1949	600	700	1	250	FW	26.2	16.1	21.6	....
	Mechanicville, N. Y		1948	600	700	1	150	FW	15.3	15.1	14.2	DB
			1949	....	....	....	....	....	....	....	....	....
	Williamsburg, Penna		1947	600	700	....	....	....	....	....	....	....
Weyerhaeuser Timber Co	Springfield, Oregon	United Engineers	1-49	570	675	3	85	BW	12.3	6.4	21.0	....
E I Du Pont de Nemours	Orange, Texas		9-47	560	750	2	150	BW	14.2	7.4	30.4	DB
			3-48	560	750	1	150	BW	14.2	7.4	30.4	DB
			10-48	560	750	1	150	BW	14.2	7.4	30.4	DB
Halifax Paper Co, Inc	Roanoke Rapids, N. C	J E Sirrene	1-49	550	725	1	98	CE	18.0	....	....	....
Ohio Boxboard Co	Rittman, Ohio	H M Wilson	7-48	500	668	1	120	BW	14.5	5.2	32.7	....
400 TO 499 PSI												
Westinghouse Elec Corp	Mansfield, Ohio		10-47	465	650	1	70	BW	6.7	....	....	....
Bakelite Corp	Bound Brook, N. J	Francisco & Jacobus	9-47	450	650	1	125	BW	16.0	5.3	29.8	DB
Capital City Prod Co	Columbus, Ohio	A M Kinney	6-48	450	Sat	3	47	BW	....	2.1	30.0	....
Clemson Agric College	Clemson, S. C		5-48	450	Sat	1	3	CE	....	....	....	....
Downington Paper Co	Downington, Penna	A C Wood	1-49	450	700	2	80	EM	10.3	4.8	24.5	DB
Emery Industries, Inc	Cincinnati, Ohio	Wm Carlton & Assoc	1949	450	650	1	125	BW	10.6	7.3	23.4	ST
Gaylord Container Corp	Bogalusa, La		1949	450	710	1	100	CE	....	....	....	....
Great Lakes Paper Co, Ltd	Fort William, Ontario	Stadler-Hurter Co	4-48	450	650	1	100	CE	12.1	6.0	....	DB
Hudson Pulp & Paper Corp	Augusta, Me		10-47	450	750	1	60	BW	6.1	2.5	37.9	DB
Huron Milling Co	Harbor Beach, Mich		9-48	450	600	1	75	Wi	9.0	3.3	30.2	....
Keystone Steel & Wire Co	So Bartonville, Ill		10-48	450	750	1	150	CE	14.3	9.9	22.3	....
			6-49	....	....	....	....	....	....	....	....	....
Merck & Co, Inc	Rahway, N. J	Lockwood Greene	10-48	450	650	1	80	EM	13.8	4.1	26.5	....
Minnesota & Ontario Paper Co	International Falls, Minn		1-49	450	600	1	50	B	....	2.8	....	DB
Ogilvie Flour Mills Co	Montreal, Que		11-48	450	660	2	30	BWG	5.0	1.3	18.5	DB

A —Air cooled
AdBr —Admiralty brass
AlBr —Aluminum brass
AC —Allis-Chalmers Mfg Co
AsCu —Arsenical copper
Ad —Admiralty
AI —Ames Iron Works
B —J P Badenhausen
Bi —Bigelow Co
BL —Black liquor
BW —Babcock & Wilcox Co
BWG —Babcock-Wilcox & Goldie-McCulloch Ltd
C —Coal, bituminous
CA —Coal, anthracite
CE —Combustion Engineering Co
Cu Ni —Copper nickel
D —Damper
DB —Dry bottom
Du —Duplex pump
EC —Erie City Iron Works
El —Elliott Co
EM —Edge Moor Iron Works
FW —Foster Wheeler Corp
G —Gas
GE —General Electric Co
H —Hydrogen cooled
HB —Heilman Boiler Works
HF —Hogged fuel
Hy —Hydraulic coupling
M —Motor drive
Ma —Magnetic coupling
MI —Murray Iron Works Co
Mp —Two motors per fan
MT —One motor, one turbine per fan
O —Oil

Institutional Power Plants: 200 Psi or Above

Furnace bottom	Economizer Surface per Boiler, 1000 sq ft	Air-Heater Surface per Boiler, 1000 sq ft	Air-Heater Type	F-D FANS: Drive	F-D FANS: Air-Volume Control	I-D FANS: Drive	I-D FANS: Gas-Volume Control	Firing	FUEL: Type	FUEL: Heating Value, 1000 Btu per lb	FUEL: Ash-Fusion Temperature, F	FEED PUMPS: Drive	FEED PUMPS: Flow Control	TURBINES: Capacity, 1000 kw	TURBINES: Speed, rpm	TURBINES: Manufacturer	TURBINES: Backpressure, psia	TURBINES: No. of Bleed Points	Generator Cooling	CONDENSERS: Surface, 1000 sq ft	CONDENSERS: No. Water Passes	CONDENSERS: Tube Material	Total Boiler Capacity Incl New Units, 1000 lb	Total Generator Capacity Incl New Units, 1000 kw
DB	0	73.0	Re	Mp	V	Mp	V	P, O, G	C, O, G	....	....	2M, 2T	....	10	3600	GE	400	0	A	None	..	.....	1,900	64.5
ST	18.7	135.7	Tu	M	V	None[2]	None[2]	P[3]	C	12.5–14.5	2200–2500	1M, 2T	S	10	3600	AC	400	0	A					
DB	.....	31.4	Re	M	D	M	V	P	C	13.5	2500	1M, 1T	R	30	3600	WE	40	2	H	None	..	.....	800	30.0
DB	.....	39.4	Re	T	S	T	S	O	O	18.9	....	3T	S	.....	.....	.....	.....	..	.....	.....	..	.....	505	10.0
DB	1.4	18.5	Tu	M, T	D	M, T	D	P	C, G	12.0–13.0	2000	1M, 1T	S	7.5	3600	GE	1.5	2	A	6.5	2	St	1,600	33.0
DB	.....	.....	Tu	1M, 1T	S, D	M, T	S, D	P	C	....	....	2M, 1T	R	.....	.....	.....	.....	..	.....	.....	..	.....	225	.....
DB	.....	17.9	Re	T	V	T	D	P	C, O, G[4]	18.0	....	3T	R	5	3600	GE	200	2	A	.....	..	.....	200	.....
DB	0	73.2	Re	M	D	M	D	O, G	O, G	....	....	1M, 1T, 1Du	S	7.5	3600	WE	250	0	A	.....	..	.....	500	10.0
DB	.....	18.0	Tu	2M, 2T	V	2M, 2T	D	P, O, G	C	13.5	2250	1M, 2T	R	7.5	3600	WE	1.5	2	A	7.5	2	AsCu	825	15.0
DB	0	49.6	Tu	M	V	M	D	P	C	12.4	2000	2M, 1T	R	20.0	3600	....	1.0	2	A	10.0	2	AlBr	500	20.0
DB	0	49.6	Tu	M	V	M	D	P	C	12.4	2000			9.4	3600	WE	4.5	2	A	8.5	2	AsCu	910	46.3
....	.....	27.1	Tu	Mp	V	Mp	V	O	O, W	18.4	....	1M, 1T	R	9.4	3600	WE	1.0	2	A					
DB	0	20.0	Tu	MT	V	T	D	P	C	14.0	2400	1M, 1T		6	3600	GE	190	0	A	.....	..	.....	585	25.0
....	2.4	....	Re	M	D	M	S, Hy	BL	BL	3.6	....	1M, 1T	R	.....	.....	.....	.....	..	.....	.....	..	.....	254	12.8
DB	0	11.8	Tu	M,[5] MT	Hy	M,[5] MT	Hy	P	C	14.2	2600	1M, 2T	R	10.0	3600	GE	1.5	1	A	5.0	2	PAd	585	25.0
DB	0	39.3	Tu	M	V	M	D	P	C	13.8	2200	1M, 1T	S	.....	.....	.....	.....	..	.....	.....	..	.....	315	.....
....	0	....	M	V	M	Hy	....	BL	6.3	....	1M, 1T	S	7.5	2400	GE	150	0	A	.....	..	.....	800	15.0
DB	2.2	3.7	Tu	MT	D	MT	D	UF(235)	C	14.0	2500	2T	R	.....	.....	.....	.....	..	.....	.....	..	.....	280	.....
DB	.....	....	Re	.....	.....	.....	.....	P	C	13.0	2000	.....	.....	.....	.....	.....	.....	..	.....	.....	..	.....	.....	.....
DB	0	8.8	Tu	3M	D, V	Mp, 3T	S, D	P, O	C, O	12.5	....	2M, 2T	S, R	.....	.....	.....	.....	..	.....	.....	..	.....	270	.....
DB	0	5.9	Re	M	S, V	M	S, D	P	C	13.6–13.9	2750–2950	4M, 2T	....	2.5	3600	GE	3.0	1	A	.....	..	.....	220	3.0
DB	1.0	3.8	Tu	M	S, V	M	S, D	P	C	13.6–13.9	2750–2950			0.5	3600	AC	3.0	1	A					
DB	0	45.2	Tu	M	V	T	S	O, G[6]	O	18.0	....	1M, 1T	R	7.5	3600	WE	1.0	1	A	10.0	2	Ad	1,270	37.5
DB	0	25.5	Tu	M	V	M	D	P	C	14.0	2150	1T	S	.....	.....	.....	.....	..	.....	.....	..	.....	500	.....
DB	18.7	....	....	M	D	M	D	TG(370)	C	13.0	....	1M, 1T	R	7.5	3600	WE	20	1	A	.....	..	.....	300	15.0
DB	0	10.3	Re	T	S, D	T	S	O, G	O	18.0	....	2M, 3T	S, R	3.4	3600	GE	150	0	A	.....	..	.....	700	16.0
DB	1.7	....	....	M	V	M	D	SS(202)	C	13.3	....	2M, 2T	R	.....	.....	.....	.....	..	.....	.....	..	.....	140	.....
DB	0	1.5	Tu	M	D	M	D	O, P	C, O	18.3	....	1M, 1T	R	2.5	3600	GE	25	0	A	.....	..	.....	.....	.....
....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	..	.....	.....	..	.....	.....	.....
DB	0	11.0	Tu	1M, 1T	S, D, V	T	S, V	SS(240)	C, CA, O	12.7	2500	1M, 1T	R	.....	.....	.....	.....	..	.....	.....	..	.....	150	.....
DB	4.6	10.4	Tu	T	S	T	S	TG(312)	C	11.0	2060	2T	S	.....	.....	.....	.....	..	.....	.....	..	.....	600	10 5
DB	0	21.8	Re	T	D	T	D	O, G	G	....	....	4M, 4T	R	30.0	3600	AC	200	0	A	.....	..	.....	1,885	35.0
DB	2.6	24.1	Tu	M	D	M	D	P	C, O	12.9	2400	1M, 1T	R	15.0	3600	WE	.....	2	A	22.5	2	AdBr	300	15.0
DB	0	17.3	Tu	M	V	M	Hy	P	C	13.0	2000	.....	.....	.....	.....	.....	.....	..	.....	.....	..	.....	.....	.....
DB	0	17.3	Tu	M	V	M	Hy	P	C	13.0	2000	.....	.....	.....	.....	.....	.....	..	.....	.....	..	.....	.....	.....
DB	0	48.0	Tu	T	S	T	S	P	C, O	12.7	1950	3T	S	.....	.....	.....	.....	..	.....	.....	..	.....	480	14.0
DB	0	11.1	Tu	M	V	M	D	P	C	14.0	2600	1M, 1T	R	2.0	3600	GE	2.0	1	A	.....	..	.....	298	11.0
....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4.0	3600	GE	2.0	1	A	.....	..	.....	.....	.....
DB	0	17.2	Tu	M	V	M	D, Hy	P	C	12.5	2100	2M, 1T	R	4.0	3600	Wo	1.0	1	A	4.0	2	Ad	.....	.....
....	5.6	....	....	M	V	M	S, D	SS(302)	C	12.6	1950	M	R	4.0	3600	GE	55	0	A	.....	..	.....	200	6.0
DB	0	15.5	Tu	M,[5] Mp	D	M,[5] Mp	D	P	C, O, G	10.8	2000	1Du, 1M, 1T	S	8.0	3600	El	1.0	1	A	4.75	2	Ad	550	.....
DB	3.5	0	...	T	S, D	T	S, D	TG(302)	C[7]	12.5	....	1M, 2T	S, R	.....	.....	.....	.....	..	.....	.....	..	.....	380	10.0
....	1.8	0	...	M	V	M	V	TG(200)	CA, O	12.0	....	1M, 2T	R	6.0	3600	GE	0.5	1	A	.....	..	.....	.....	.....
DB	....	0	...	T	D	T	D	G	G	0.9[8]	....	5T	R	0.6	1200	Wo	50						120	6.6
DB	....	56.6	Tu	M	D	M	S, Ma	P	C	11.0	1950	2T	S, R	11.5	3600	GE	85	1	A	.....	..	.....	1,100	22.0
DB	0	0	...	T	S	T	D	G	G	1.07[8]	....	1M, 1T	R	15.0	3600	AC	20	1	A	.....	..	.....	1,484	29.0
DB	0	21.0	Tu	M	V	M	S, D	P	C	13.8	2150	2T	R	8.0	3600	Wo	5	1	A	.....	..	.....	105	3.0
DB	.....	4.1	Tu	M	D	T	D	G, O	G	1.0[8]	....	2T	S	6.0	3600	WE	2.0	0	A	6.5	2	Ad	305	13.0
....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4.0	3600	WE	45	1	A	.....	..	.....	.....	.....
DB	0	27.7	Tu	M	D, V	MT	V	P	C	14.3	1900	2T	....	2.0	3600	GE	150	0	A	.....	..	.....	224	2.8
....	15.9	0	...	T	S	T	S, D	SS(516)	C	14.3	2300	.....	....	4.0	3600	El	165	0	A	.....	..	.....	400	12.0
DB	8.4	4.3	Pl	.....	.....	M	Hy	P	CA	11.9	3000	.....	.....	10.0	3600	WE	1.0	2	A	13.0	2	Ad	1,200	47.0
....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	450	15.0
....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7.5	3600	WE	1.0	2	A	7.0	2	Ad	.....	.....
....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6.0	3600	WE	1.0	2	A	4.8	4	Ad	120	10.0
DB	0	11.9	Tu	M	D	M	D	HF, O	W, O	4.5	....	2M, 1T	R	7.5	3600	WE	40	1	A	7.9	..	.....	.....	.....
DB	0	23.9	Tu	T	S, V	T	S	G	G	1.0[8]	....			5.0	3600	WE	150	1	A	6.3	..	.....	.....	.....
DB	0	23.9	Tu	T	S, V	T	S	G	G	1.0[8]	....	3T	S	10.0	3600	GE	30	1	A	.....	..	.....	.....	15.0
DB	0	23.9	Tu	T	S, V	T	S	G	G	1.0[8]	....													
....	.....	.....	...	M	D	M	Hy	BL	BL	6.5	....	1M, 1T	R	.....	.....	.....	.....	..	.....	.....	..	.....	242	.....
....	5.5	0	...	M	D	M	D	TG(375)	C	10.2	2100	T	S	6.0	3600	GE	1.0	1	A	6.5	2	Ad	440	15.0
....	2.0	.....	...	M	V	M	V	UF(204)	C	12–13.0	2300–2500	.....	.....	.....	.....	.....	.....	..	.....	.....	..	.....	190	0.5
DB	.....	.....	...	MT	V	MT	.....	UF(367)	C	13.7	2600	T	R	.....	.....	.....	.....	..	.....	.....	..	.....	270	.....
....	0	0	...	T	D	T	S	SS(99)	C	12.0	2200	2T	S	.....	.....	.....	.....	..	.....	.....	..	.....	2,000	.....
DB	.....	.....	...	.....	.....	.....	.....	O	O	....	....	.....	.....	0.1	1800	GE	2.0	1	.....	.....	..	.....	.....	.....
DB	0	8.5	Tu	M	D	T	S	P	C	....	....	1M, 1T	R	.....	.....	.....	.....	..	.....	.....	..	.....	295	0.4
ST	....	....	Pl	M	V	M	Hy	P	C, O	14.4	2700	1M, 1T	S	.....	.....	.....	.....	..	.....	.....	..	.....	235	0.2
....	.....	.....	.....	.....	.....	.....	.....	BL	BL	.....	.....	.....	.....	.....	.....	.....	.....	..	.....	.....	..	.....	1,400	40.0
DB	0	10.2	Tu	M	V	M	Hy	P	C	11.4–12.9	2000	.....	.....	.....	.....	.....	.....	..	.....	.....	..	.....	500	9.0
DB	....	3.4	Tu	M	D, V	M	D	O	O	17.7	....	.....	.....	.....	.....	.....	.....	..	.....	.....	..	.....	130	.....
....	6.1	4.5	Tu	M	V	M	D	SS(178)	C	13.5	2450	1M, 2T	R	1.5	3600	GE	150	0	A	.....	..	.....	230	3.8
....	.....	.....	...	M	D	M	D	SS(440)	C	10.0	....	1M, 1T	S, R	.....	.....	.....	.....	..	.....	.....	..	.....	390	26.8
DB	3.8	0	...	T	S	T	S	UF(209)	C	14.5	2500	1M	S	10.0	3600	GE	1.0	1	A	10.0	2	.....	.....	.....
DB	0	12.0	Tu	M	D	M	S, D	W	W	8.0	....	1M	R	1.5	3600	Wo	140	0	A	.....	..	.....	360	4.4
DB	1.2	.....	...	M	D	M	D	TG	C, O	13.0	2100	2M, 1T	R	7.5	3600	GE	1.0	2	A	8.5	2	Ad	700	25.0
														2.0	1800	Wo	1.0	2	A	1.0	1	St	60	3.0

P —Pulverized-fuel firing
PAd —Phosphoric admiralty
Pl —Plate
R —Regulator
Re —Regenerative
RS —Riley Stoker Corp
S —Speed control
SS —Spreader stoker
St —Steel

ST —Slag tap
T —Turbine drive
Te —Terry Steam Turbine Co
TG —Traveling-grate stoker
TI —Titusville Iron Works Div
Tu —Tubular
UF —Underfeed stoker
UI —Union Iron Works
V —Vane control

Vo —Henry Vogt Machine Co
W —Wood
WB —Wm Bros Boiler & Mfg Co
WE —Westinghouse Electric Corp
Wi —Wickes Boiler Co
Wo —Worthington Pump & Machy
[1]—Heat release in cyclone furnace only
[2]—Pressurized furnace

[3]—Cyclone burners, 2 per boiler
[4]—Also acid sludge, soda tar
[5]—Motor for one unit, others as described
[6]—Tar also burned
[7]—Coke breeze
[8]—Btu per cu ft
(150)—Stoker grate area, sq ft

1948 Design Survey of Typical Industrial and

For notes on uses and limitations of this tabulation • See page 122

Compiled by J C McCabe, Associate Editor

Company	Location	Consulting Engineers	First Operation, New Units	Nominal Pressure, psi	Nominal Steam Temperature, F	BOILERS				Furnace Volume, 1000 cu ft	Heat Release, 1000 Btu per cu ft per hr	Furnace bottom
						Number	Capacity, Each, 1000 lb per hr	Manufacturer	Heating surface, 1000 sq ft			
J&J Rogers Co	Ausable Forks, N. Y		12-48	450	600	1	60	EC	8.4	....	....	....
Steel Co of Canada	Hamilton, Canada	A G McKee	3-48	450	750	3	125	CE	17	20.7	18.2	DB
						1	125	CE	18.9	20.7	16.9	DB
Sun Oil Co	Marcus Hook, Penna		2-48	450	512	2	105	BW	10.8	4.4	28.2	....
Sun Oil Co	Toledo, Ohio		2-47	450	520	1	75	BW	7.5	3.3	26.7	....
Walworth Co	Kewanee, Ill			450	510	1	60	EM	6.3	3.8	....	....
Ware Industries, Inc	Ware, Mass	Harrison G White	10-48	450	556	2	50	RS	5.2	3.4	....	....
Westinghouse Elec Corp	Trafford, Pa		12-48	450	750	1	85	Vo	8.5	3.2	....	....
St Regis Paper Co	North Pensacola, Fla		3-48	435	650	2	45	BW	6.7	3.6	....	ST
Forstman Woolen Co	Garfield, N. J	Stone & Webster	1947	430	700	1	80	RS	2.8	....	20.1	DB
E I Du Pont de Nemours	Waynesboro, Va		1-48	425	713	1	120	BW	12.7	7.8	19.2	....
Oscar Mayer & Co	Madison, Wisc	Helmick, Edeskuty & Lutz	2-49	425	700	1	125	Wi	....	....	....	....
Northern Furniture Co	Sheboygan, Wisc	E E Ashley	4-48	425	615	1	40	BW	6.5	2.2	....	DB
Pullman Standard Car Mfg	Michigan City, Ind	Laramore & Douglas	8-47	425	750	2	50	WB	7.9	3.0	22.0	....
St Regis Paper Co	North Pensacola, Fla		3-48	425	650	1	150	BW	11.2	5.8	32.8	DB
Westclox Div, Gen Time Instr Co	La Salle, Illinois	Laramore & Douglas	1948	425	750	2	35	RS	5.5	1.6	29.8	....
Colgate-Palmolive-Peet	Jersey City, N. J	Burns & Roe	5-48	420	600	1	75	CE	10.8	3.5	28.7	DB
Corn Products Refining	North Kansas City, Mo	V E Alden	3-49	420	570	1	175	BW	14.2	12.1	19.4	DB
Corn Products Refining	Corpus Christi, Texas	H K Ferguson	10-48	420	750	1	250	BW	23.1	13.2	26.8	DB
Bureau of Yards and Docks	Philadelphia, Pa	H A Kuljian	1948	415	750	2	125	CE	16.4	7.8	24.4	DB
Merrimac Hat Corp	Amesbury, Mass		9-48	415	550	2	25	BW	3.1	0.9	27.5	....
Rhinelander Paper Co	Rhinelander, Wisc		1948	415	580	1	90	BW	8.6	3.5	30.1	....
Schlitz Brewing Co	Milwaukee, Wisc	H A Kuljian	1948	415	700	4	80	CE	9.5	....	26.5	DB
Schmidt & Sons, Inc	Philadelphia, Pa	H A Kuljian	1948	415	700	2	60	CE	7.7	3.4	20.0	DB
Canadian Sugar Factories, Ltd	Taber, Alberta	Stearns-Roger	9-49	410	625	2	70	BWG	10.9	4.6	20.3	DB
Holly Sugar Corp	Brawley, Calif			410	575	1	150	RS	19.3	7.8	....	....
Owens-Illinois Glass Co	Elkhart, Indiana	H M Wilson	1948	410	650	1	110	BW	12.7	4.9	35.0	DB
J I Case Co	Rockford, Ill		9-48	400	725	1	50	BW	6.5	2.5	25.6	....
			9-49	400	725	1	50	BW	6.5	2.5	25.6	....
Champion International Paper Co	Lawrence, Mass	C T Main	....	400	625	1	70	RS	9.3	3.7	24.8	DB
Clearwater Finishing Co	Old Fort, N. C	Pierson & Whitman	12-47	400	615	2	50	CE	5.6	3.5	22.3	DB
Colgate-Palmolive-Peet	Jeffersonville, Ind	Burns & Roe	....	400	600	2	65	CE	9.6	4.2	20.4	DB
Corn Products Refining	Pekin, Ill	Sargent & Lundy	1-49	400	570	2	175	BW	16.8	8.2	27.8	DB
General Electric Co	Schenectady, N. Y		10-48	400	750	2	200	BW	17.1	15.7	16.6	DB
Halltown Paper Board	Halltown, W. Va	John W Peach	9-48	400	700	1	50	BW	5.4	1.7	42.3	....
Meadow River Lumber	Rainelle, W. Va		1948	400	700	2	50	BW	6.8	3.1	24.0	DB
National Cash Register	Dayton, Ohio		11-47	400	750	1	100	BW	10.0	4.3	33.9	DB
			11-48	400	750	....	....	....	....	....	....	....
Prairie State Paper Mills	Middletown, Ohio	B M Baxter	1-49	400	570	1	55	BW	....	....	....	....
Quaker Oats Co	Pekin, Ill		1948	400	600	1	40	BW	4.7	1.8	29.4	DB
Security Mills Inc	Newtonville, Mass	D D Emes	11-47	400	....	....	....	....	....	....	....	....
Sonoco Products Co	Hartsville, S. C		5-47	400	600	1	70	BW	7.6	2.7	30.3	DB
Sorg Paper Co	Middletown, Ohio		12-48	400	700	....	....	....	....	....	....	....
250 TO 399 PSI												
Consolidated Paper Co	Monroe, Mich		2-48	350	580	2	150	BW	14.4	5.8	25.0	....
Mohawk Carpet Mills	Amsterdam, N. Y		9-48	350	....	....	....	....	....	....	....	....
Hooker Electrochemical Co	Niagara Falls, N. Y		11-48	300	Sat	1	168	RS	....	....	....	....
Michigan State College	East Lansing, Mich	C R Erickson	....	300	550	2	110	Wi	13.0	4.8	....	DB
E I Du Pont de Nemours	Parkersburg, W. Va		....	290	Sat	2	50	CE	6.9	2.2	29.4	DB
Armstrong Rubber Co	West Haven, Conn		7-48	270	412	1	50	Bi	7.1	2.4	29.0	DB
National Tube Co	Lorain, Ohio	H K Ferguson	11-47	265	550	3	60	CE	11.3	....	....	....
General Electric Co	Pittsfield, Mass		3-48	265	406	1	35	BW	....	....	....	....
American Viscose Corp	Parkersburg, W. Va	H A Kuljian	1948	250	600	....	....	....	....	....	....	....
Jos Bancroft & Sons Co	Wilmington, Del	H A Kuljian	1948	250	560	1	75	....	7.9	3.3	28.6	DB
Canadian Industries, Ltd	Nobel, Ontario	C R Bown	11-47	250	505	2	18	CV	....	....	....	....
Columbia Mills	Minetto, N. Y			250	525	1	60	CE	....	....	....	....
Cranston Print Works	Cranston, R. I	Westcott & Mapes	12-48	250	450	1	50	Bi	6.6	2.8	23.3	....
Firestone Tire & Rubber Co	Pottstown, Pa		12-47	250	Sat	1	60	BW	....	....	....	....
Gillette Safety Razor Co	South Boston, Mass		5-47	250	Sat	2	20	BW	....	....	....	....
Harshaw Chemical Co	Gloucester City, N. J		8-48	250	Sat	2	30	CE	....	....	....	....
Haywood Schuster Woolen Mills	East Douglas, Mass	G H Perkins	4-48	250	460	1	30	Bi	4.3	1.3	29.0	....
Iowa State College	Ames, Iowa	Brown Engrg	1-49	250	506	1	100	RS	....	....	....	....
Johns Hopkins Univ	Baltimore, Md	Egli & Gompf	10-48	250	Sat	1	50	BW	7.1	1.7	33.2	....
La Grande Laundry Co, Inc	San Francisco, Calif	King-Knight	8-48	250	405	1	20	Bi	3.1	....	....	....
Eli Lilly & Co	Indianapolis, Ind	E B Badger	2-48	250	401	1	75	BW	....	....	....	....
M F A Dairy Products Co	Monette, Mo	D Harman	9-48	250	400	2	....	UI	....	....	....	....
John A Manning Paper Co	Troy, N. Y	C J Barrow	10-49	250	510	1	40	RS	....	....	....	....
McCall Frontenac Oil Co, Ltd	Montreal, Quebec		1948	250	500	3	54	DBr	8.0	2.6	27.1	DB
Oval Wood Dish Co	Tupper Lake, N. Y	J L Graham	3-48	250	405	1	30	Bi	....	....	....	....
Penn State College	State College, Pa	P F Loftus Corp	8-48	250	520	1	50	BW	....	....	....	....
Pioneer Brewing Co	Joliet, Ill		7-48	250	....	2	10	BW	....	....	....	....
Goodyear Tire & Rubber Co	Topeka, Kansas			240	400	4	33	BW	....	....	....	....
Raybestos-Manhattan, Inc	Manheim, Pa		11-47	235	400	1	25	BW	....	....	....	....
Rock Hill Printing & Finishing	Rock Hill, S. C	Lockwood Greene	....	230	575	....	....	....	....	....	....	....
Carnation Co	Richland Center, Wis		....	225	550	1	45	BW	6.4	....	24.8	....
Case Institute	Cleveland, Ohio	Wilbur Watson & Assoc	9-48	225	450	1	40	BW	5.7	1.6	34.5	....
Davison Chemical Corp	Baltimore, Md		1-48	225	Sat	1	24	EM	4.0	....	....	....
Diamond Match Co	Barberton, Ohio	H F Hallock	4-48	225	500	1	36	BW	6.0	....	....	....
Empire Box Corp	Stroudsburg, Pa			225	560	1	23	CE	....	....	....	....
						1	27	CE	....	....	....	....
Hat Corp of America	East Norwalk, Conn	Westcott & Mapes	6-47	225	488	1	50	Bi	6.2	2.4	27.5	....
Winchester Repeating Arms	New Haven, Conn	A E Stilson	4-48	225	463	1	12	Bi	....	....	....	....
American Cyanamid Corp	Wallingford, Conn	F P Bello	6-48	220	395	1	50	RS	8.1	3.5	18.0	....
Owens-Illinois Glass Co	Elkhart, Indiana	H M Wilson	1947	220	....	1	30	....	5.3	....	35.0	....
Mount Hope Finishing Co	No. Dighton, Mass		9-48	210	490	3	50	BW	....	....	....	....

A —Air cooled
AC —Allis-Chalmers Mfg Co
AsCu—Arsenical copper
Ad —Admiralty
AI —Ames Iron Works
B —J P Badenhausen
Bi —Bigelow Co
BL] —Black liquor
BW —Babcock & Wilcox Co
BWG—Babcock-Wilcox & Goldie-McCulloch Ltd
C —Coal, bituminous
CA —Coal, anthracite
CE —Combustion Engineering Co
CuNi—Copper nickel
CV —Canadian Vickers, Ltd
D —Damper
DB —Dry bottom
DBr —Dominion Bridge Co
Du —Duplex pump
EC —Erie City Iron Works
El —Elliott Co
EM —Edge Moor Iron Works
FW —Foster Wheeler Corp
G —Gas
GE —General Electric Co
H —Hydrogen cooled
Hy —Hydraulic coupling
M —Motor drive
Ma —Magnetic coupling
MI —Murray Iron Works Co
Mp —Two motors per fan
MT —One motor, one turbine per fan
Mu —Munts metal
O —Oil

Institutional Power Plants: 200 Psi or Above cont'd

Economizer Surface per Boiler, 1000 sq ft	Air-Heater Surface per Boiler, 1000 sq ft	Air-Heater Type	F-D FANS: Drive	F-D FANS: Air-Volume Control	I-D FANS: Drive	I-D FANS: Gas-Volume Control	Firing	FUEL: Type	FUEL: Heating Value, 1000 Btu per lb	FUEL: Ash-Fusion Temperature, F	FEED PUMPS: Drive	FEED PUMPS: Flow Control	TURBINES: Capacity, 1000 kw	TURBINES: Speed, rpm	TURBINES: Manufacturer	TURBINES: Backpressure, psia	TURBINES: No. of Bleed Points	Generator Cooling	CONDENSERS: Surface, 1000 sq ft	CONDENSERS: No. Water Passes	CONDENSERS: Tube Material	Total Boiler Capacity Incl New Units, 1000 lb	Total Generator Capacity Incl New Units, 1000 kw
1.7	....	...	M	D	M	D	TG(170)	CA	13.0	....	2M, 1T	R	1.5	3600	GE	1.0	1	A	1.5	2	Ad	130	4.0
3.2	24.8	Tu	T, Mp	S	T, Mp	S	O, G	O	18.5	....	3T	S	4.0	3600	Wo	160	1	A	.....	..	.....	500	.....
3.3	10.2	Tu	T, Mp	S	T, Mp	S	TG(536)[7]	.....	....	....													
....	8.1	Tu	T	S	T	S	O, G	O	20.0	....	1M, 1T	R	....	....	....	.....	..	..	.....	..	.....	880	0.8
....	5.7	Tu	T	S	T	S	O, G	O	17.8	....	1M, 1T	R	....	....	....	.....	..	..	.....	..	.....	190	....
2.6	0	...	Mp	D	T	D	SS	C	10.5	2300	3T	R	....	....	....	.....	..	..	.....	..	.....	160	3.3
....	5.8	Tu	MT	D, V	MT	V	P	C, O	13.0	2100	1M, 1T	S	....	....	....	.....	..	..	.....	..	.....	100	3.3
....	7.0	Tu	M	V	M	V	SS(150)	C	10.0	2100	1M, 2T	S, R	....	....	....	.....	..	..	.....	..	.....	235	.....
1.2	4.3	Tu	M	D	M	D	BL	BL	3.7	....													
0	....	Tu	T	S, D	T	S, D	P	C	13.0	2800	1M, 2T	R	2.5	3600	GE	1.0	1	A	2.0	2	Ad	240	7.8
0.6	13.0	Tu	T	S, V	T	S, V	P	C	13.3	2200	T	S, R	3.0	3600	WE	1.0	2	A	4.0	2	Ad	....	12.0
....	....	...	Mp	D	Mp	.....	TG	C	10.5	....												225	3.7
0	....	Tu	T	S	T	S	P	C	15.0	2300	1M, 1T	S, R	1.5	3600	AC	1.0	1	A	1.5	2	Ad	70	2.3
....	4.1	Tu	M	V	M	D	SS(180)	C	10.5	2215	2T	S	2.0	3600	AC	1.0	1	A	3.5	2	.....	200	5.1
....	14.0	Tu	M	D	M	D	G, O	G	1.0[8]	....	1M, 1T	R	10.0	3600	WE	1.0	1	A	8.0	2	Ad	275	10.0
0	2.6	Tu	M	V	M	S	SS(120)	C	10.0	2000	2M, 1T	....	1.5	3600	WE	20	1	A	.....	..	.....	105	4.5
4.9	0	...	M	V	M	V	TG(330)	CA	11.5	2900	M	R	2.5	3600	GE	1.0	2	A	2.5	2	Ad	380	5.6
0	29.9	Tu	M	D	M	D	P	C	10.3	1900	1M, 1T	R										505	....
0	41.5	Tu	M	D	M	D	G	G	1.1[8]	....	1M, 1T	R	6.0	3600	AC	25	1	A	.....	..	.....	250	6.0
....	6.2	Re	2M	V	2T	D	P	C	13.5	2500	T	R										500	....
....	....	...	M	D	T	D	SS	C	14.0	2400	2T	S	0.6	5750	GE	1.0	2	A	0.4	2	.....	70	1.0
													0.4	5750	GE	20	2	A					
6.7	0	...	M	D	M	D	UF(168)	C	13.2	2400	T	R	2.0	3600	GE	....	0	A	3.8	2	CuNi	450	12.0
....	5.6	Tu	2M, 2T	V	2M, 2T	D	P	C	12.0	2100	1M, 2T	R	5.0	3600	AC	1.0	1	A	2.0	2	Ad	320	5.0
....	4.4	Tu	MT, 1M	.....	.....	V	P	C, O	13.9	2100	1M, 1T	R										180	....
....	14	Tu	M	D	M	D	G	G	1.05[8]	....	1M, 1T	R	2.0	3600	WE	35	0	A	.....	..	.....	140	2.0
....	....	...	M	D, V	M	D, V	O	O	....	....	2M, 1T	....	3.0	3600	GE	42	..	A	.....	..	.....	150	3.0
5.2	....	...	M	D	M	D	P	C, O	12.3	....	T	R	3.5	3600	AC	35	0	A	.....	..	.....	240	61.0
4.7	0	...	M	D	M	S, Hy	SS(145)	C	....	....	1M, 1T	R	3.5	3600	WE	20	1	A	4.8	2	Ad	150	7.0
4.7	0	...	M	D	M	S, Hy	SS(145)	C															
0	6.6	Tu	M	V	M	V	P	C, O	13.9	2400													
0	5.6	Tu	MT	S, D	MT	S, D	P	C	14.0	2560	1M, 2T	S	1.5	3600	WE	1.0	1	A	1.3	2	Mu	100	1.5
0	9.7	Tu	M	V	M	V	P	C	10.2	1900	M	R	2.0	3600	GE	1.5	2	A	2.5	2	Ad	210	3.5
3.7	10.0	Tu	T	D	T	D	TG(486)	C	10.2	2066	2T	S, R	7.5	3600	AC	20	1	A	.....	..	.....	.....	13.0
0	30.0	Re	M	S, D	M	D	P	C		....	M, T	R	7.5	3600	GE	1.0	2	A	.....	..	.....	.....	
1.7	0	...	M	D	M	D	SS(129)	C	13.8	2700	2T	R	1.0	1200	Wo	40	..	A	.....	..	.....	85	1.8
0	0	...	MT	V	MT	.....	SS(136)	C	13.4	2500	1M, 2T	R	3.8	3600	WE	0.5	3	A	4.0	2	Ad	115	8.0
4.4	....	...	M	S, D	MT	Ma	TG(351)	C	10.5	2200												300	20.0
....	....	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4.0	3600	WE	1.0	1	A	5.0	2	Mu		
....	....	...	T	S	T	S	TG(174)	C	....	....	1M, 1T	R	1.5	3600	WE	20	..	A	.....	..	.....	75	15.0
2.2	0	...	M	V	M	D	SS(89.4)	C	11.2	2000	1M, 1T	R	1.5	3600	GE	1.0	1	A	1.0	4	Ad	40	1.5
....	....	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.8	1200	Wo	5.0	2	A	.....	..	.....	.....	1.2
....	4.3	Tu	M	V	M	D	SS(115)	C, O	14.5	2450–2750	2M, 1T	R	4.5	3600	WE	40	1	A	.....	..	.....	160	5.0
....	....	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7.5	3600	GE	40	1	A	.....	..	.....	290	17.5
5.5	0	...	T	S	T	S	SS(303)	C	13.4	2100	3T	S											
....	....	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1.5	3600	GE	23	2	A	0.7	2	Ad	120	2.0
....	....	...	.....	.....	.....	.....	P	C	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	446	.....
....	7.2	Tu	M	S, D	M	.....	SS(234)	C	11–13.0	....	3M, 1Du	R	3.0	3600	GE	1.0	2	A	.....	1	.....	435	7.0
0	0	...	T	V	T	S	SS(135)	C	12.7	2000	2T	R	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
....	....	...	M	V	M	D	O	O	18.5	....	4Du	R	.....	.....	.....	.....	.....	.....	.....	.....	.....	120	.....
....	....	...	T	D	T	S	TG(315)	C,[7]	10.0[8]	2570	3T	S	.....	.....	.....	.....	.....	.....	.....	.....	.....	1,506	43.0
....	....	...	.....	.....	.....	.....	.....	CA	....	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	110	.....
....	....	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5.0	3600	GE	30	..	A	10.0	2	Ad	600	30.5
													10.0	2400	GE	1.0	1	A					
....	....	...	M	V	M	D	UF(204)	C	13.5	2250	1M	R	2.5	3600	WE	1.0	1	A	4.0	2	Ad	290	6.5
....	....	...	.....	.....	.....	.....	SS(48)	C	....	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	30	.....
....	....	...	.....	.....	.....	.....	P	C	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	130	1.5
....	....	...	M	D	MT	D	O	O	18.5	....	1M, 1T	R	....	....	....	.....	..	..	.....	..	.....	150	.....
....	....	...	.....	.....	.....	.....	O	O	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	160	.....
....	....	...	.....	.....	.....	.....	O	O	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	100	2.0
....	....	...	.....	.....	.....	.....	UF(98)	C	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	60	.....
....	....	...	M	.....	M	.....	O	O	18.0	....	.....	....	1.25	3600	GE	2	1	..	.....	..	.....	85	1.25
....	....	...	.....	.....	.....	.....	TG(378)	C	.....	.....	.....	....	3.0	3600	GE	1.0	2	..	.....	..	.....	300	5.5
1.0	....	...	MT	D	T	D	SS(133)	C	13.8	2700	2T	R	.....	.....	.....	.....	.....	.....	.....	.....	.....	83	0.8
....	....	...	.....	.....	.....	.....	O, G	O	1.1[8]	....	2M	S	0.2	....	AI	.....	.....	.....	.....	.....	.....	40	0.2
....	....	...	.....	.....	.....	.....	SS(170)	C	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	215	.....
....	....	...	.....	.....	.....	.....	O	O, G	.....	.....	.....	.....	0.6	3600	EI	12	.....	.....	.....	.....	.....	.....	.....
....	....	...	.....	.....	.....	.....	P	C, O	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	88	.....
....	3.6	Tu	MT	D	MT	D	O, G	O	18.6	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
....	....	...	.....	.....	.....	.....	.....	W	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
....	....	...	.....	.....	.....	.....	UF(170)	C	.....	.....	.....	.....	4.0	3600	EI	15	1	..	.....	..	.....	170	8.0
....	....	...	.....	.....	.....	.....	O	O, G	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	20	.....
....	....	...	.....	.....	.....	.....	.....	O	O, G	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	132	.....
....	....	...	.....	.....	.....	.....	TG(130)	CA	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	75	.....
....	....	...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5.0	3600	Wo	20	1	..	.....	..	.....	3,000	8.5
2.9	....	...	.....	.....	.....	.....	UF(124)	C	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	101	3.4
0	0	...	MT	S, D	.....	D	TG(150)	C	11.0–12.0	2250	2T	R	0.3	3600	EI	5	0	A	.....	..	.....	78	0.3
....	....	...	T, Mp	V	.....	D	O	O	18.0	....	2Du	R	.....	.....	.....	.....	.....	.....	.....	.....	.....	100	.....
0	0	...	M	D	.....	D	SS	C	.....	.....	2M	R	1.5	3600	GE	1.0	1	A	.....	..	.....	96	2.6
....	....	...	.....	.....	.....	.....	TG(160)	CA	.....	.....	.....	.....	1.0	3600	WE	25	4	..	.....	..	.....	50	21.0
....	....	...	.....	.....	.....	.....	TG(216)	CA	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
....	....	...	M	V	.....	.....	O	O	18.5	....	1T, 1Du	S, R	.....	.....	.....	.....	.....	.....	.....	.....	.....	125	.....
....	....	...	.....	.....	.....	.....	W	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
0	5.8	Tu	MT	V	MT	D	SS(167)	C, O	13.6	2600	1M, 1T	R	.....	.....	.....	.....	.....	.....	.....	.....	.....	75	0
....	....	...	M	D	M	D	TG(326)	C	12.3	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	240	61.0
....	....	...	.....	.....	.....	.....	O	O	.....	.....	.....	.....	1.0	3600	GE	30	0	.....	.....	.....	.....	330	4.7

P —Pulverized-fuel firing
PAd —Phosphoric admiralty
Pl —Plate
R —Regulator
Re —Regenerative
RS —Riley Stoker Corp
S —Speed control
SS —Spreader stoker
St —Steel

ST —Slag tap
T —Turbine drive
Te —Terry Steam Turbine Co
TG —Traveling-grate stoker
TI —Titusville Iron Works Div
Tu —Tubular
UF —Underfeed stoker
UI —Union Iron Works
V —Vane control

Vo —Henry Vogt Machine Co
W —Wood
WB —Wm Bros Boiler & Mfg Co
WE —Westinghouse Electric Corp
Wi —Wickes Boiler Co
Wo —Worthington Pump & Machy

1—Heat release in cyclone furnace only
2—Pressurized furnace
3—Cyclone burners, 2 per boiler
4—Also acid sludge, coal tar
5—Motor for one unit, others as described
6—Tar also burned
7—Coke breeze
8—Btu per cu ft
(150)—Stoker grate area, sq ft

1948 Design Survey of Typical Industrial and

For notes on uses and limitations of this tabulation • See page 122

Compiled by J C McCabe, Associate Editor

Company	Location	First Operation, New Units	Nominal Pressure, psi	Nominal Steam Temperature, F	BOILERS: Number	BOILERS: Capacity, Each 1000 lb per hr	BOILERS: Manufacturer	BOILERS: Firing	TURBINES: Capacity, 1000 kw	TURBINES: Speed, rpm	TURBINES: Manufacturer	TURBINES: Backpressure, psia	TURBINES: No. of Bleed Points	Total Boiler Capacity Incl New Units, 1000 lb	Total Generator Capacity Incl New Units, 1000 kw
160 TO 200 PSI															
American Woolen Mills	Plymouth, Mass	3-48	200	388	1	....	CE	O	1.25	3600	GE	5	1	72	2.0
Armstrong Cork Co	Camden, N. J	4-48	200	500	1	....	K	O	....	....	....	....	..	....	....
E L Bruce Co	Memphis, Tenn	.....	200	Sat	2	28	CE	WW	1.25	3600	GE	12	1	72	2.5
					1	17	EM	WW	1.25	3600	AC	12	1		
Chevrolet Motor Co	Flint, Mich	.....	200	387	4	60	....	SS (143)	....	....	...	....	..	240	....
Chevrolet Motor Co	Parma, Ohio	8-48	200	Sat	4	80	....	TG (163)	....	....	...	....	..	320	....
Copland Converting & Finishing Co	Burlington, N. C	.....	200	Sat	1	....	CB	.....	....	....	...	....	..	....	....
Derby Gas & Electric Co	Derby, Conn	5-47	200	388	3	15	Bi	O	....	....	...	....	..	45	....
El Paso Natural Gas Co	Frankel, Texas	11-47	200	Sat	2	22	Vo	G	....	....	...	....	..	44	....
Embreeville State Hosp	Chester, Pa	4-47	200	388	1	15	Bi	C	....	....	...	....	..	....	....
Fort Wayne Corrugated Paper Co	Hartford City, Ind	9-48	200	388	2	20	CE	SS (61)	....	....	...	....	..	40	....
Fort Wayne Corrugated Paper Co	Chicago, Ill	4-48	200	388	2	18	CE	O, G	....	....	...	....	..	36	....
French Sardine Co of California	Terminal Island, Calif	8-47	200	388	1	20	Bi	O, G	....	....	...	....	..	....	....
General Electric Co	Decatur, Ill	1948	200	...	2	20	BW	CA	....	....	...	....	..	....	....
General Motors Corp	Columbus, Ohio	9-46	200	391	2	70	....	SS (202)	1.0	3600	...	5	0	140	....
General Plywood Corp	Savannah, Ga	4-48	200	Sat	2	15	EC	WW	....	....	...	....	..	30	....
Hamilton Mfg Co	Two Rivers, Wis	10-48	200	Sat	1	45	BW	SS (156)	2.0	3600	GE	1.0	1	100	2.8
Hilton-Davis Chemical Co	Cincinnati, Ohio	8-48	200	...	1	35	BW	UF (112)	....	....	...	....	..	115	....
Hockmeyer Bros, Inc	Lowell, Mass	10-48	200	388	2	14	Bi	O	....	....	...	....	..	28	....
Howard Smith Paper Mills	Beauharnois, Que	12-47	200	388	1	30	CV	UF (97)	....	....	...	....	..	60	....
Institute of Paper Chemistry	Appleton, Wis	9-47	200	...	1	8	CB	.. ....	....	....	...	....	..	12	....
Lloyd Mfg Co	Apponaug, R. I	7-48	200	388	1	7	CB	O	....	....	...	....	..	....	....
M & R Dietetic Lab, Inc	Sturgis, Mich	11-48	200	500	2	26	BW	TG (110)	0.6	3600	GE	12	0	52	0.6
NY, NH and Hartford RR	Providence, R. I	6-47	200	388	1	20	Bi	O	....	....	...	....	..	....	....
Ohio State Univ	Columbus, Ohio	9-49	200	615	1	100	BW	P	....	....	...	....	..	428	10.5
Palatka Gum Processing	Palatka, Florida	3-47	200	Sat	2	4	CB	O	....	....	...	....	..	9	....
E B Pritchard & Co	Bridgeton, N. J	.....	200	Sat	1	65	BW	O	....	....	...	....	..	120	....
St Mary's Sugar Co-op	Jeanerette, La	11-47	200	388	3	5	Bi	O,[1]	0.8	1200	MI	15	0	....	0.8
United Refining Co	Warren, Pa	6-48	200	Sat	1	55	UI	P	....	....	...	....	..	165	....
Warren Steam Pump Co	Warren, Mass	3-48	200	388	1	9	Bi	C	....	....	...	....	..	....	....
Western Okla Hospital	Fort Supply, Okla	7-48	200	382	2	15	EC	O	....	....	...	....	..	48	....
Anglo Fabrics Co	Webster, Mass	.....	190	...	1	17	CB	O	....	....	...	....	..	50	....
Freuhauf Trailer Co	Avon Lake, Ohio	1-47	190	...	2	45	UI	O	....	....	...	....	..	150	....
					1	60	UI	O							
Univ of New Hampshire	Durham, N. H	.....	190	386	1	35	RS	SS (98)	....	....	...	....	..	....	....
Godchaux Sugars, Inc	Raceland, La	9-48	180	Sat	1	40	Vo	G	0.8	3600	GE	30	0	200	1.0
Pittsburgh Plate Glass	Creighton, Penna	2-48	180	Sat	2	70	EC	SS (178)	....	....	...	....	..	180	....
Blue Ridge Textile Co	Bangor, Penna	1-48	175	370	1	40	K	SS (100)	....	....	...	....	..	85	....
E L Bruce	Little Rock, Ark	1947	175	Sat	1	33	BW	WW	....	....	...	....	..	109	1.6
		1948	175	Sat	1	33	BW	WW							
Bureau of Yards & Docks	Philadelphia, Pa	.....	175	Sat	2	125	CE	P	....	....	...	....	..	250	....
Chevrolet Motor Co	Indianapolis, Ind	12-47	175	365	1	15	UI	UF (100)	....	....	...	....	..	45	....
Crown Zellerbach Corp	Carthage, N. Y	.....	175	Sat	1	40	CE	SS (130)	....	....	...	....	..	80	....
Ford Motor Co	Canton, Ohio	7-48	175	370	2	36	CE	SS (122)	....	....	...	....	..	128	....
International Harvester Co	Memphis, Tenn	11-47	175	377	2	60	....	TG (182)	....	....	...	....	..	120	....
Synthane Corp	Oaks, Pa	.....	175	375	1	...	EM	CA	....	....	...	....	..	....	....
Boston & Maine RR	Mechanicville, N. Y	9-48	170	375	2	16	Bi	SS	....	....	...	....	..	48	....
Arborite Co, Ltd	Ville La Salle, Que	5-48	165	373	1	20	CV	O	....	....	...	....	..	20	....
E L Bruce Co	Nashville, Tenn	3-48	165	Sat	1	43	BW	WW	0.3	3600	AC	10	A	69	1.0
E I Du Pont de Nemours	Edge Moor, Dela	3-47	165	Sat	1	80	BW	O	....	....	...	....	..	....	....
General Foods Corp	Avon, N. Y	6-47	165	373	1	10	Bi	O	....	....	...	....	..	....	....
International Business Machines Corp	Endicott, N. Y	7-48	165	360	1	83	RS	UF (190)	....	....	...	....	..	230	....
International Shoe Co	Manchester, N. H	2-48	165	475	...	....	BW	SS (163)	....	....	...	....	..	100	3.0
Ohio Match Co	Wadsworth, Ohio	3-47	165	...	1	75	RS	TG (215)	....	....	...	....	..	135	2.0
St Regis Paper Co	East Pepperell, Mass	11-48	165	480	1	55	EC	SS (153)	....	....	...	....	..	115	....
Berkshire Fine Spinning Assoc	Adams, Mass	12-48	160	370	1	20	Bi	SS	....	....	...	....	.	60	....
Brown-Forman Distillers	Shively, Kentucky	2-48	160	310	1	45	Vo	O	....	....	...	....	..	75	....
Certain-Teed Prod Corp	Savannah, Ga	7-48	160	374	1	40	EC	O	....	....	...	....	..	70	....
Dana Corp	Fort Wayne, Ind	1948	160	...	3	15	CE	SS (49)	....	....	...	....	..	45	....
Detroit Steel Corp	Hamden, Conn	9-48	160	370	2	27	Bi	SS	....	....	...	....	..	54	....
Electric Auto-Lite Co	Bay City, Mich	.....	160	360	1	42	BW	SS (130)	....	....	...	....	..	100	....
Federal Leather Co	Belleville, N. J	.....	160	368	1	60	BW	CA	....	....	...	....	..	100	....
General Electric Co	New Kensington, Pa	4-48	160	...	1	20	UI	UF (79)	....	....	...	....	..	30	....
General Logan Airport	Boston, Mass	12-48	160	370	2	65	Bi	O	....	....	...	....	..	130	....
Georgetown Univ Hospital	Washington, D. C	7-47	160	...	3	26	BW	O	...	....	...	....	..	....	....
Maltine Co	Morris Plains, N. J	11-47	160	360	2	10	BW	O	....	....	...	....	..	50	....
Neisler Mills, Inc	Kings Mountain, N. C	.....	160	360	2	13	BW	SS	.. ..	....	...	....	..	46	....
Oliver Corp	South Bend, Ind	.....	160	Sat	1	34	BW	TG (201)	....	....	...	....	..	59	....
Perfect White Steam Ldy	Brooklyn, N. Y	7-48	160	372	1	15	EC	CA	....	....	...	....	..	....	....
Princeton Knitting Mills	Watertown, Conn	7-47	160	370	1	35	Bi	O	....	....	...	....	..	60	....
St Regis Paper Co	Watertown, N. Y	11-47	160	Sat	1	40	BW	SS (121)	....	....	...	....	..	60	....
Spalding Laundry	Louisville, Ky	4-48	160	Sat	1	28	BW	SS (78)	0.3	225	SE	....	..	56	0.6
Textron, Inc	Manchester, N. H	3-48	160	450	2	14	BW	O	....	....	...	....	..	28	....
Universal Sewer Pipe	Urichsville, Ohio	1948	160	Sat	1	7	EC	SS (46)	....	....	...	....	..	17	....
Univ of Alabama	Tuscaloosa, Ala	1-49	160	Sat	1	55	Vo	UF (132)	....	....	...	....	..	150	....
Western Electric Co	Allentown, Pa	1947	160	Sat	3	20	BW	O	....	....	...	....	..	63	....
		1947	160	Sat	1	3	EC	O							

A —Air cooled
AC —Allis-Chalmers Mfg Co
Bi —Bigelow Co
BW —Babcock & Wilcox Co
C —Coal, bituminous
CA —Coal, anthracite
CB —Cleaver-Brooks Co
CE —Combustion Engineering Co
CV —Canadian Vickers, Ltd
DBr —Dominion Bridge Co
EC —Erie City Iron Works
El —Elliott Co
EM —Edge Moor Iron Works
G —Gas
GE —General Electric Co
HB —Heilman Boiler Works
K —E Keeler Co
KB —Kewanee Boiler Corp
L —E Leonard & Sons, Ltd
MI —Murray Iron Works Co
O —Oil
P —Pulverized-fuel firing
RS —Riley Stoker Corp
SS —Spreader stoker
TG —Traveling-grate stoker
Ti —Titusville Iron Works Co
UF —Underfeed Stoker
UI —Union Iron Works
Vo —Henry Vogt Machine Co
Wi —Wickes Boiler Co
WW —Wood waste
RF —Reverberating furnace
SE —Skinner Engine Co
1—Bagasse
2—Waste-heat boiler
3—Canadian Vickers Co—constructors
(150)—Stoker grate area, sq ft

Institutional Power Plants: Below 200 Psi

For notes on uses and limitations of this tabulation • See page 122

Compiled by J C McCabe, Associate Editor

Company	Location	First Operation, New Units	Nominal Pressure, psi	Nominal Steam Temperature, F	BOILERS: Number	BOILERS: Capacity, Each 1000 lb per hr	BOILERS: Manufacturer	Firing	TURBINES: Capacity, 1000 kw	TURBINES: Speed, rpm	TURBINES: Manufacturer	TURBINES: Backpressure, psia	TURBINES: No. of Bleed Points	Total Boiler Capacity Incl New Units, 1000 lb	Total Generator Capacity Incl New Units, 1000 kw
150 TO 159 PSI															
Buckeye Cotton Oil Co	Louisville, Ky	12-48	155	Sat	1	25	BW	TG (123)	....	....	...	....	..	52	....
Hassler Lumber Co	Truckee, Calif	6-48	155	368	1	13	Bi	.....	....	....	...	....	..	....	....
G F Heublein & Bros, Inc	Hartford, Conn	6-47	155	368	1	10	Bi	O	....	....	...	....	..	....	....
Tell City Chair Co	Tell City, Indiana	1947	155	...	1	36	Vo	.....	....	....	...	....	..	55	0.4
White Motor Co	Cleveland, Ohio	.....	155	Sat	1	15	UI	O	....	....	...	....	..	42	....
					2	12	CB	O							
Allis Chalmers Mfg Co	La Porte, Ind	9-47	150	440	3	60	RS	TG (194)	....	..	...	....	..	180	....
Alpha Creamery Co	Hesperia, Mich	4-47	150	366	1	15	Bi	O	....	....	...	....	..	....	....
Atlantic Union College	So. Lancaster Mass	7-47	150	450	1	32	BW	SS (72)	....	....	...	....	..	....	....
Aurora Gasoline Co	Detroit, Mich	5-48	150	366	1	10	Bi	O	....	....	...	....	..	....	....
Behr-Manning Co	Troy, N. Y	.....	150	366	2	40	RS	.....	....	....	...	....	..	120	....
Borden Co	Waukesha, Wis	7-48	150	Sat	1	50	EC	SS	....	....	...	....	..	84	....
E J Brach & Sons	Chicago, Ill	3-48	150	...	1	60	BW	TG	....	....	...	....	..	130	....
California Packing Corp	Sacramento, Calif	.....	150	...	1	75	BW	O, G	....	....	...	....	..	75	....
Canton Refining Div	Canton, Ohio	4-48	150	Sat	2	28	CE	SS (90)	....	....	...	....	..	56	....
Chicopee Mfg Corp	Chicopee Falls, Mass	11-47	150	366	1	40	BW	O	....	....	...	....	..	55	....
Diamond Match Co	Oshkosh, Wis	.....	150	Sat	1	30	BW	SS (90)	....	...	...	....	..	90	1.0
Drackett Co	Sharonville, Ohio	1947	150	366	1	50	BW	SS	....	....	...	....	..	104	....
Father Flanagan's Boys Home	Boys Town, Neb	1-48	150	365	4	10	BW	O, G	....	....	...	....	..	40	....
Ferguson Tractor Co	Detroit, Mich	9-48	150	366	2	15	Bi	O	....	....	...	....	..	40	....
					1	10	Bi	O							
Food Concentrates, Inc	Woodbridge, N. J	8-48	150	366	1	10	Bi	CA	....		...	....	..	....	....
Frigidaire Div	Dayton, Ohio	10-48	150	Sat	1	125	BW	P	....	..	...	....	..	428	....
Glass Products, Inc	Ellwood City, Pa	.....	150	Sat	2	8	CB	O, G	....	....	...	....	..	....	....
L F Grammes & Son	Allentown, Pa	5-47	150	Sat	1	3	HB	O	....	....	...	....	..	....	....
Kelsey Hayes Wheel Co	Monroe, Mich	1947	150	Sat	1	60	Wi	SS (200)	....	....	...	....	..	142	....
Monarch Mills	Union, S. C	2-48	150	Sat	1	8	BW	O	1.5	3600	GE	25	1	....	....
Pennsylvania P & L Co	Lancaster, Pa	6-47	150	Sat	1	15	HB	O, G	....	....	...	....	..	....	....
Pfeiffer Brewing Co	Detroit, Mich	1947	150	Sat	1	50	BW	O, G	....	....	...	....	..	100	....
Phillips Co	Akron, Ohio	1-48	150	Sat	1	27	BW	UF (98)	....	....	...	....	..	45	....
Pittsburgh Plate Glass	Ford City, Pa	1-48	150	Sat	2	40	EC	UF (113)	....	....	...	....	..	160	....
St Regis Paper Co	No. Pensacola, Fla	3-48	150	366	1	35	BW	WW	....	....	...	....	..	....	....
Schenley Distilleries, Inc	Milwaukee, Wis	5-48	150	Sat	1	50	BW	TG (188)	....	....	...	....	..	160	....
Schenley Distilleries, Inc	Lexington, Ky	5-47	150	Sat	1	40	....	SS (144)	....	....	...	....	..	115	....
Schenley Distilleries, Inc	Louisville, Ky	6-47	150	Sat	1	40	....	TG	....	....	...	....	..	55	....
P E Schreider Co	Allentown, Pa	5-47	150	Sat	1	3	HB	O	....	....	...	....	..	....	....
Sheffield Farms Co	Norwich, N Y	1-48	150	Sat	3	30	Vo	P	....	....	...	....	..	90	....
Siemon Co, Inc	Bridgeport, Conn	11-47	150	366	1	15	Bi	O	....	....	...	....	..	....	....
South Jersey Gas Co	Glassboro, N. J	7-48	150	406	1	18	RS	SS (54)	....	....	...	....	..	48	....
Stamford Rolling Mills	Springdale, Conn	8-48	150	366	1	10	Bi	O	....	....	...	....	..	....	....
Stevens Paper Mills, Inc	So. Hadley Falls, Mass	2-48	150	366	1	13	Bi	O	....	....	...	....	..	....	....
Sunshine Biscuits, Inc	Long Island City, N. Y	5-48	150	358	1	32	CE	O	....	....	...	....	..	....	....
Tin Processing Corp	Texas City, Texas	.....	150	Sat	2	16	CE	RF[2]	....	....	...	....	..	35	....
United Farmers of N. E	Charlestown, Mass	10-47	150	366	1	11	Bi	O	....	....	...	....	..	35	....
Univ of Akron	Akron, Ohio	9-47	150	359	2	14	BW	UF	....	....	...	....	..	....	....
Velsicol Corp	Marshall, Ill	10-47	150	366	1	21	BW	O	....	....	...	....	..	28.8	....
Wilmington Fibre Specialty Co	New Castle, Delaware	.....	150	Sat	1	5	CB	O	....	....	...	....	..	45	1.0
Zion Industries, Inc	Zion, Ill	.....	150	366	1	17	CB	O	....	....	...	....	..	17	....
														17	....
149 PSI AND BELOW															
American Linen Supply	Seattle, Wash	2-48	140	Sat	2	20	BW	O	....	....	...	....	..	40	....
Consumers Gas Co	Toronto, Ont	9-47	140	460	1	45	DBr	G	....	....	...	....	..	407	....
Bond Stores, Inc	Rochester, N. Y	11-47	130	Sat	3	36	UI	O	....	....	...	....	..	108	....
Braendly Dye Works	Beacon, N. Y	5-48	130	355	1	45	K	SS (142)	....	....	...	....	..	111	....
Firth Carpet Co	Auburn, N. Y	1-48	130	355	1	35	CE	SS (112)	....	....	...	....	..	55	....
Immigration & Naturalization	Ellis Island, N. Y	7-48	130	347	2	20	BW	O	....	....	...	....	..	61	....
Babcock & Wilcox Tube Co	Beaver Falls, Pa	2-48	125	353	2	75	BW	SS (169)	....	....	...	....	..	205	....
Calco Chemicals Div	Marietta, Ohio	3-48	125	Sat	1	23	Wi	SS (68)	....	....	...	....	..	40	....
Cheshire Mills	Harrisville, N. H	2-48	125	...	1	16	EM	UF (72)	....	....	...	....	..	38	....
					1	22	EM	C							
Cluett-Peabody & Co	Atlanta, Ga	5-48	125	..	1	5.5	CB	O	....	....	...	....	..	16	....
Columbia Metals Corp	Salem, Ore	12-47	125	...	1	3.5	CB	O	....	....	...	....	..	170	....
					1	17	CB	O							
Cottrell Paper Co	Rock City Falls, N. Y	12-47	125	...	1	6	K	UF (30)	....	....	...	....	..	....	....
Godchaux Sugars, Inc	Raceland, La	9-48	125	Sat	1	40	EM	O	....	....	...	....	..	200	1.0
					1	40	CE	O							
F C Huyck & Sons	Albany, N. Y	12-47	125	Sat	1	40	BW	O	....	....	...	....	..	75	....
Industrial Center, Inc	New Haven, Conn	9-48	125	353	2	10	Bi	O	....	....	...	....	..	20	....
Macfadden Foundation	Lansville, N. Y	.....	125	...	2	10	....	UF	....	....	...	....	..	20	....
Merchants Distilling Corp	Terre Haute, Ind	.....	125	...	2	25	Vo	TG (109)	....	....	...	....	..	125	....
Misericordia Hospital	Edmonton, Alta	6-48	125	335	2	5	L	G	....	....	...	....	..	15.5	....
					1	7	K[3]	G							
S Morgan Smith Co	York, Pa	11-47	125	353	1	34	BW	O	....	....	...	....	..	54	....
Pennsylvania Laundry Co	Philadelphia, Pa	.....	125	350	1	35	RS	O	0.3	180	El	....	..	90	1.0
					1	55	RS	TG (170)							

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CA —Coal, anthracite
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P —Pulverized-fuel firing
RS —Riley Stoker Corp
SS —Spreader stoker
TG —Traveling-grate stoker
Ti —Titusville Iron Works Co
UF —Underfeed Stoker
UI —Union Iron Works
Vo —Henry Vogt Machine Co
Wi —Wickes Boiler Co
WW —Wood waste
RF —Reverbatory furnace
SE —Skinner Engine Co
[1]—Bagasse
[2]—Waste-heat boiler
[3]—Canadian Vickers Co—constructors
(150)—Stoker grate area, sq ft

Industrials and Institutionals: Below 200 Psi

For notes on uses and limitations of this tabulation • See this page

Compiled by J C McCabe, Associate Editor

Company	Location	First Operation, New Units	Nominal Pressure, psi	Nominal Steam Temperature, F	BOILERS: Number	BOILERS: Capacity, Each 1000 lb per hr	BOILERS: Manufacturer	Firing	TURBINES: Capacity, 1000 kw	TURBINES: Speed, rpm	TURBINES: Manufacturer	TURBINES: Backpressure, psia	TURBINES: No. of Bleed Points	Total Boiler Capacity Incl New Units, 1000 lb	Total Generator Capacity Incl New Units, 1000 kw
149 PSI AND BELOW, Con'td															
Phoenix Mfg Co	Joliet, Ill	.....	125	...	1	20	BW	O	....	....	...	....	..	40	....
R & R Clothing Co	Allentown, Pa	6-47	125	Sat	1	3	HB	O	....	....	...	....	..	....	....
Raybestos Manhattan Corp	Charleston, S. C	1947	125	Sat	2	35	BW	O	....	....	...	....	..	....	....
Sanger Winery Assoc	Sanger, Calif	.....	125	...	1	9	BW	O	....	....	...	....	..	....	....
Smith College	Northampton, Mass	1-48	125	...	3	40	EM	O	....	....	...	....	..	120	....
Springfield Woolen Mills	Springfield, Tenn	1947	125	Sat	2	17	BW	C	....	....	...	....	..	....	....
U S Veterans Admin	Sunmount, N. Y	10-47	125	Sat	1	14	BW	SS	....	....	...	....	..	....	0.3
Visking Corp	Chicago, Ill	12-47	125	353	1	60	BW	O	....	....	...	....	..	108	....
General Ribbon Mills, Inc	Catasauqua, Penna	2-48	120	340	1	30	CE	UF (58)	....	....	...	....	..	....	....
Standard Brands, Inc	Red Wing, Minn	6-47	115	347	1	12	RS	UF (51)	....	....	...	....	..	23	....
American Hide & Leather Co	Ballston Spa, N. Y	12-47	100	337	1	30	CE	TG (127)	....	....	...	....	..	60	....
Amoskeag Lawrence Mills	Manchester, N. H	.....	100	337	2	9	CB	O	....	....	...	....	..	27	....
					1	10	CB	O							
Chrysler Corp	Newark, Delaware	1948	...	...	3	14	CB	O	....	....	...	....	..	....	....
Commonwealth of Kentucky		1948	100	Sat	2	6	Ti	UF (36)	....	....	...	....	..	12	....
Dominion Bridge Co, Ltd	Lachine, Que	.....	100	338	3	23	DBr	UF (72)	....	....	...	....	..	....	....
Duplan Corp	Winston-Salem, N. C	1947	...	...	1	....	K	O	....	....	...	....	..	....	....
Fritzche Bros, Inc	Clifton, N. J	2-48	100	...	1	11	BW	O	....	....	...	....	..	22	....
Hathaway Mfg Co	New Bedford, Mass	.....	100	Sat	2	12	BW	O	....	....	...	....	..	24	....
Hillsboro Hotel	Tampa, Florida	7-47	100	Sat	1	7	BW	O	....	....	...	....	..	13	....
Edward Hines Lumber Co	Chicago, Ill	.....	100	330	2	6	KB	O	....	....	...	....	..	12	....
Interchemical Corp	Union, N. J	.....	100	324	1	4	CB	O	....	....	...	....	..	4	....
Kingan & Co	Omaha, Neb	.....	100	...	1	14	CB	O	....	....	...	....	..	....	....
Lionel Corp	Irvington, N. J	.....	...	Sat	1	21	BW	O	....	....	...	....	..	42	....
Mercy Hospital	Hamilton, Ohio	5-48	100	325	1	20	BW	O	....	....	...	....	..	30	....
Mount Holyoke College	South Hadley, Mass	.....	100	Sat	3	15	RS	O	....	....	...	....	..	34.3	....
Museum of Science & Industry	Chicago, Ill	2-48	100	...	1	14	CB	O	....	....	...	....	..	26	....
Oneida, Ltd	Sherrill, N. Y	3-48	100	Sat	1	15	BW	SS (54)	....	....	...	....	..	13	....
Pittsburgh Plate Glass	Detroit, Mich	11-47	...	...	2	11	EC	UF (49)	....	....	...	....	..	31	....
Sacred Heart Hospital	Yankton, S. Dak	.....	100	Sat	3	4	K	UF (49)	....	....	...	....	..	....	....
Texas College of Mines	El Paso, Texas	9-48	100	...	1	4	....	O	....	....	...	....	..	....	....
Toledo Scale Co	Toledo, Ohio	6-48	100	338	1	11	K	UF (57)	....	....	...	....	..	33	....
Union College	Schenectady, N. Y	.....	100	Sat	2	27	BW	SS	....	....	...	....	..	54	....
Universal Match Corp	Chicago, Ill	5-48	100	...	1	18	BW	SS (57)	....	....	...	....	..	32	....
Univ of Florida	Gainesville, Fla	5-48	100	Sat	1	34	BW	O	....	....	...	....	..	....	....
Univ of Maine	Orono, Maine	1947	100	Sat	2	30	BW	O	....	....	...	....	..	....	....
Van Curler Hotel	Schenectady, N. Y	.....	100	338	2	7	BW	O	....	....	...	....	..	14	....
Veterans Admin. Center	Hot Springs, S. Dak	.....	100	358	1	10	CE	C	....	....	...	....	..	30	....
					1	10	BW	UF (220)							
					1	10	MI	C							
Wayne Knitting Mills, Inc	Humboldt, Tenn	.....	100	...	2	10	BW	SS (56)	....	....	...	....	..	20	....

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WW —Wood waste
RF —Reverberating furnace
SE —Skinner Engine Co
1—Bagasse
2—Waste-heat boiler
3—Canadian Vickers Co—constructors
(150)—Stoker grate area, sq ft

General Notes on Design-Survey Tabulations

Knowing how the information in these tables is compiled helps to make clear their uses and limitations.

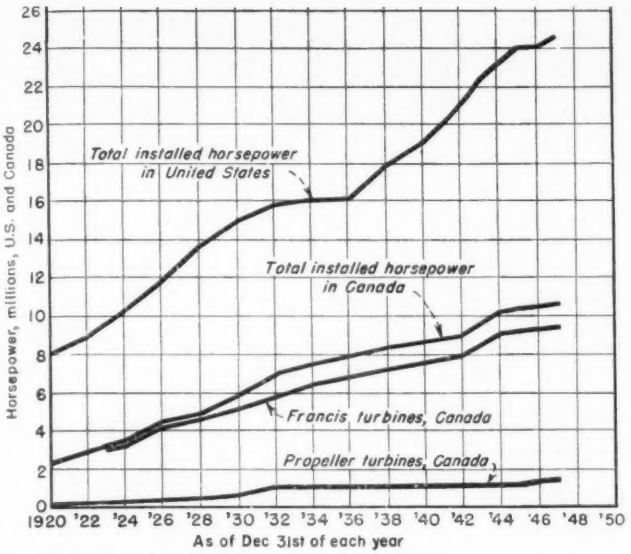
As a continuing operation, POWER's editors assemble news of installations being planned and equipment being ordered. From these records, questionnaires are mailed to the individual companies, asking for details of their projects. The replies form the basis for the tables.

No information is published except that returned on the questionnaire forms. This insures the accuracy of the data and the willingness of the plant owner to see them published. At approximately yearly intervals, data are tabulated and published, as in preceding pages.

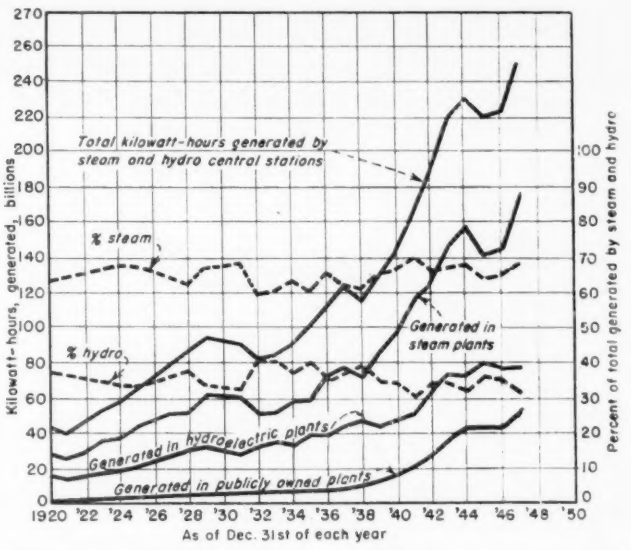
It can be seen that, in the nature of things, these tabulations cannot be complete. Nor can the published list correspond exactly in point of time with actual installations or announcement of them. Where engineering is done a long time ahead of construction, data may appear in the tables well before start of construction.

On the other hand, many publicly announced installations do not appear until long after the fact is widely known, when engineering has gone ahead sufficiently to allow the owner to supply full technical information. In such cases, the matter is followed and when the data become available they are listed. Each set of tables is checked against preceding ones to avoid duplication.

Thus, while each listing represents the most complete data available anywhere, and is representative of design and construction work in progress at that time, it does not include *all* current programs, nor does it consist entirely of strictly current construction.


Horsepower, millions, U.S. and Canada
Total installed horsepower in United States
Total installed horsepower in Canada
Francis turbines, Canada
Propeller turbines, Canada
As of Dec 31st of each year

INSTALLED CAPACITY. Total hydroelectric power that was installed in U. S. and Canada during last 27 years. In U. S. 500,000 hp of new hydro capacity was installed last year


Kilowatt-hours, generated, billions
Percent of total generated by steam and hydro
Total kilowatt-hours generated by steam and hydro central stations
% steam
% hydro
Generated in steam plants
Generated in hydroelectric plants
Generated in publicly owned plants
As of Dec. 31st of each year

POWER GENERATION. Power generated in U. S. steam and hydro central stations, kilowatt-hours supplied by each class of plant and the percent of total that each class generated

Hydro Advances in U. S. and Canada With Over 7,000,000 Hp on Order

▶NEW HYDROELECTRIC-PLANT construction continues at an accelerated rate. This is true of projects being constructed not only by governmental agencies, but also by public utilities and industrial interests, as the tables, pp 130-133 show. Here are recorded all projects for which power-generating equipment has been ordered, except some of the smaller installations. Because of space limitations, we have also omitted several large projects being constructed by governmental agencies, for which power-generating equipment had not been ordered.

U. S. Hydro. This year's table for the U. S. lists over 4,500,000 hp of new capacity on order or being installed as of Dec 31, 1947, compared to 3,150,000 hp in last year's table. Because of conditions growing out of the war—shortage of labor and materials, and slow deliveries of power-generating equipment—new capacity has not been going into operation as fast as expected. In 1946 it was only about 15,000 hp, but increased to about 500,000 in 1947, bringing the total for the U. S. to 24,500,000 hp; see curves upper left. Of the total capacity going into service last year, Grand Coulee accounted for 330,000 hp.

Governmental agencies are now making over 80% of the water-power developments. The tables, p 127, list 70 such projects that have an ultimate capacity of nearly 16,000,000 hp, of which 13,250,000 hp have been installed or are on order. The map, p 126, shows locations of the projects.

In spite of the large water-power development programs of government agencies, utility companies are also active and have about 1,000,000 hp on order or under construction. These projects extend across the country, with the largest in Idaho and California.

Because 1947 was a poor water year in many parts of the country, power generated by water was slightly less than in 1946, or 78-billion kwhr. This condition, combined with a large increase in total power generation, 223-billion to 255-billion kwhr, caused that produced by hydro to drop to 30.5% of total generation, about the same as in 1930 and 1941, see curves upper right.

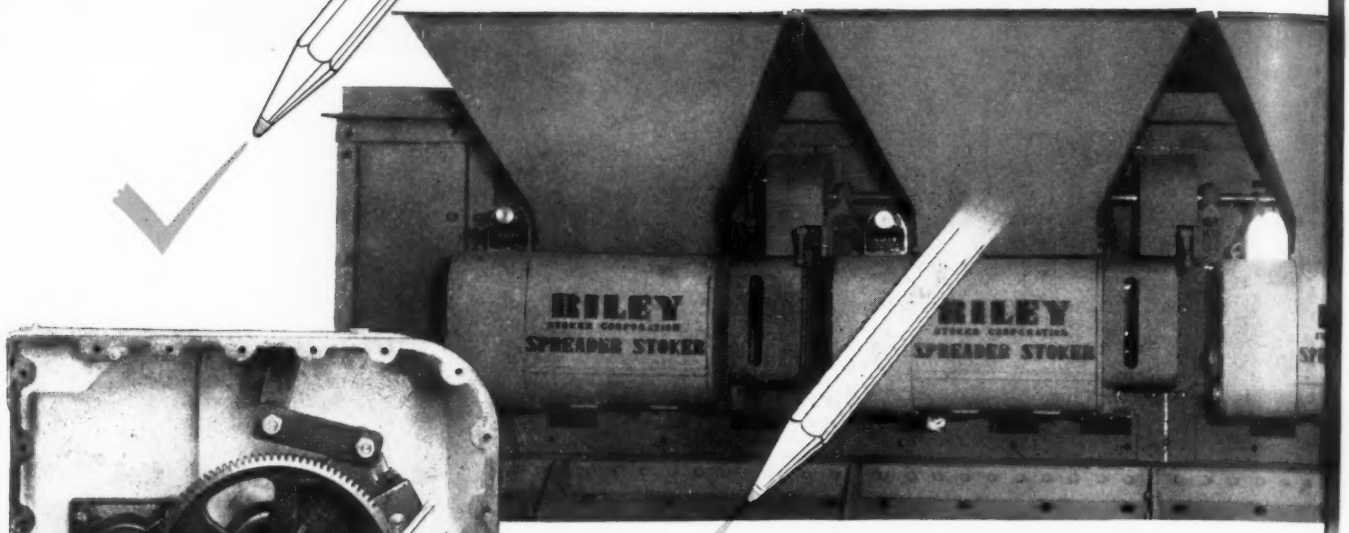
Grand Coulee. Grand Coulee plant on the Columbia River continues to be the largest power plant, either steam or hydro, in the world, with an ultimate capacity of 3,012,000 hp, or 2,190,000 kw. It now has 1,513,000 hp, or 1,100,000 kw installed in nine 165,000-hp main units and two 14,000-hp service units. Six more units are on order for installation in 1949-50, which will increase the plant's capacity to 2,503,000 hp, or 1,820,000 kw.

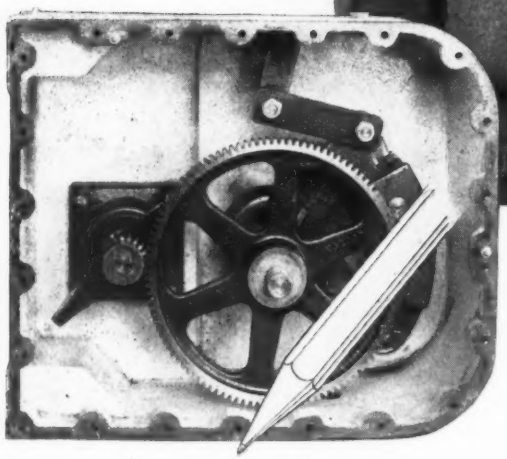
Canadian Hydro. In proportion to population, water power in Canada is being developed on a much larger scale than in the U. S. This would be expected because 97.5% of central-station power is hydro generated.

There is now under construction about 2,750,000 hp, of new plant capacity and additions to existing plants. Of this amount, 1,750,000 hp is in three projects: 500,000 hp for the Des Joachims plant of the Hydro-Electric Commission of Ontario, 660,000 hp for an extension to Beauharnois plant of the Quebec Hydroelectric Commission, and 620,000 for the Bridge River plant of the Bridge River Power Co in British Columbia.

Power generated by central stations in Canada increased to nearly 44-billion kwhr in 1947, a gain of 8% over 1946. Of this amount, the Hydro Electric Power Commission of Ontario generated or purchased 13.7 billion kwhr, or 32%. This power system is next to the largest in the world, being a close second to the Tennessee Valley Authority, which generated 14.8-billion kwhr last year.

Check These 4 Items





1 FEEDER DRIVE

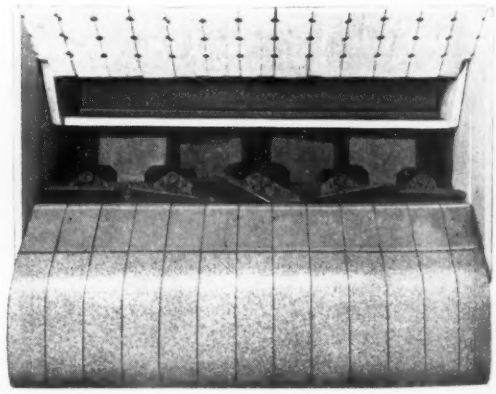
Check for — **simplicity**
accessibility
ease of lubrication
maintenance

The Riley Spreader Stoker feeder drive employs an adaptation of the Stephenson link mechanism giving an extremely simple drive which provides complete speed control from zero to maximum coal feeding capacity. The mechanism is completely enclosed and is splash lubricated practically eliminating maintenance.

2 DISTRIBUTOR

Check **whether overthrowing or underthrowing; means for adjusting lateral distribution; accessibility**

Riley employs the overthrowing distributor which provides the most uniform longitudinal distribution and prevents damage and outage caused by wedging of foreign materials between distributor and housing. The angle of the distributor blades is adjustable in order to vary lateral distribution. Ready access is provided to distributor from front of stoker.



TRADE MARK Rx REGISTERED

RILEY

STOKER CORPORATION, WORCESTER, MASS.

Boston New York Philadelphia Washington Buffalo Cleveland Detroit Chicago St. Louis Cincinnati St. Paul Pittsburgh Kansas City Denver Seattle Portland Los Angeles Houston New Orleans Atlanta Memphis Tulsa

BOILERS • PULVERIZERS • BURNERS • STOKERS • SUPERHEATERS • FLUE GAS SCRUBBERS

when Purchasing Spreader Stokers

GRATE DRIVE

3

Check for — **range of control**
lubrication
power required to drive
simplicity

Riley uses a hydraulically driven ratchet drive completely enclosed. This simple rugged drive automatically lubricated has practically no maintenance, is not susceptible to damage in case of grate obstruction and has low power consumption.

GRATE SURFACE

4

Check for —
method of support
size of individual grates
air distribution

The Riley grate surface consists of small grates only 2 inches wide with 6-inch pitch, mounted on carrier bars which are bolted to skid shoes fastened to rugged steel roller conveyor chains. The skid shoes slide on a rail. This construction eliminates all strains from the grates themselves. By use of large numbers of small grates uniform air distribution and low maintenance is obtained.

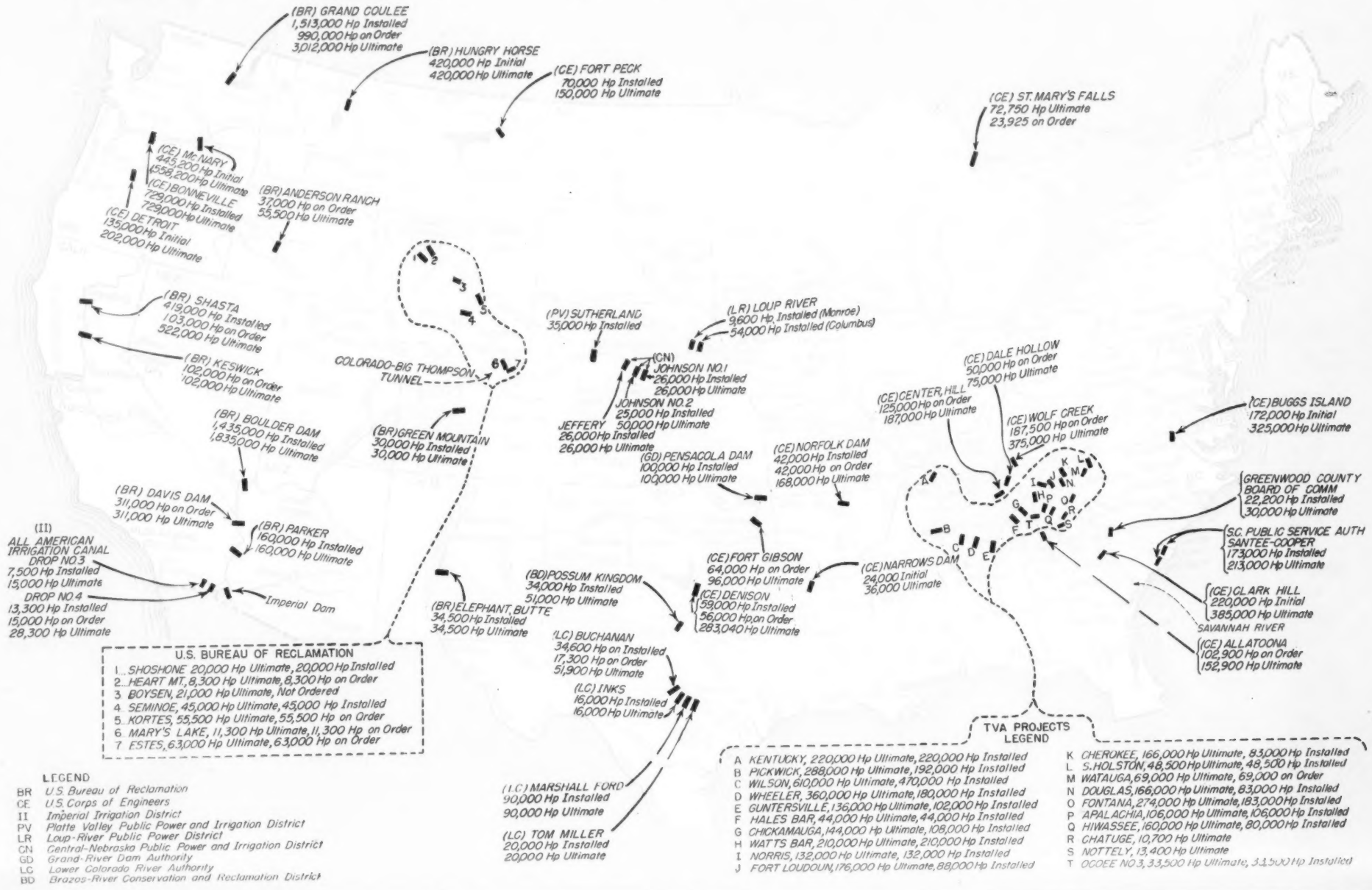
A survey of your Power Plant by a consulting engineer will possibly show ways of making surprisingly large savings in your power costs

COMPLETE STEAM GENERATING UNITS

. . . it will pay you to visit modern Riley Installations before purchasing Boiler or Fuel Burning Equipment

ECONOMIZERS • WATER-COOLED FURNACES • STEEL-CLAD INSULATED SETTINGS • AIR HEATERS

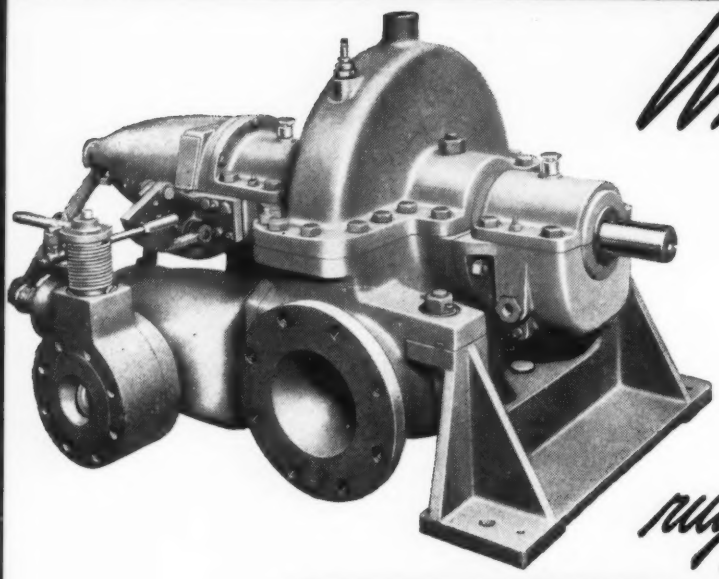
Location and Capacity of Government Hydro Projects


(BR) GRAND COULEE
1,513,000 Hp Installed
990,000 Hp on Order
3,012,000 Hp Ultimate
(BR) HUNGRY HORSE
420,000 Hp Initial
420,000 Hp Ultimate
(CE) FORT PECK
70,000 Hp Installed
150,000 Hp Ultimate
(CE) ST. MARY'S FALLS
72,750 Hp Ultimate
23,925 on Order
(CE) McNARY
445,200 Hp Initial
558,200 Hp Ultimate
(CE) BONNEVILLE
729,000 Hp Installed
729,000 Hp Ultimate
(CE) DETROIT
135,000 Hp Initial
202,000 Hp Ultimate
(BR) ANDERSON RANCH
37,000 Hp on Order
55,500 Hp Ultimate
(BR) SHASTA
419,000 Hp Installed
103,000 Hp on Order
522,000 Hp Ultimate
(BR) KESWICK
102,000 Hp on Order
102,000 Hp Ultimate
COLORADO-BIG THOMPSON TUNNEL
(BR) BOULDER DAM
1,435,000 Hp Installed
1,835,000 Hp Ultimate
(BR) GREEN MOUNTAIN
30,000 Hp Installed
30,000 Hp Ultimate
(PV) SUTHERLAND
35,000 Hp Installed
(LR) LOUP RIVER
9,600 Hp Installed (Monroe)
54,000 Hp Installed (Columbus)
(CN) JOHNSON NO.1
26,000 Hp Installed
26,000 Hp Ultimate
JOHNSON NO.2
25,000 Hp Installed
50,000 Hp Ultimate
JEFFERY
26,000 Hp Installed
26,000 Hp Ultimate
(GD) PENSACOLA DAM
100,000 Hp Installed
100,000 Hp Ultimate
(CE) NORFOLK DAM
42,000 Hp Installed
42,000 Hp on Order
168,000 Hp Ultimate
(CE) DALE HOLLOW
50,000 Hp on Order
75,000 Hp Ultimate
(CE) CENTER HILL
125,000 Hp on Order
187,000 Hp Ultimate
(CE) WOLF CREEK
187,500 Hp on Order
375,000 Hp Ultimate
(CE) BUGGS ISLAND
172,000 Hp Initial
325,000 Hp Ultimate
GREENWOOD COUNTY BOARD OF COMM
22,200 Hp Installed
30,000 Hp Ultimate
SC PUBLIC SERVICE AUTH SANTEE-COOPER
173,000 Hp Installed
213,000 Hp Ultimate
(CE) CLARK HILL
220,000 Hp Initial
385,000 Hp Ultimate
SAVANNAH RIVER
(CE) ALLATOONA
102,900 Hp on Order
152,900 Hp Ultimate
(BR) DAVIS DAM
311,000 Hp on Order
311,000 Hp Ultimate
(BR) PARKER
160,000 Hp Installed
160,000 Hp Ultimate
(II) ALL AMERICAN IRRIGATION CANAL
DROP NO.3
7,500 Hp Installed
15,000 Hp Ultimate
DROP NO.4
13,300 Hp Installed
15,000 Hp on Order
28,300 Hp Ultimate
Imperial Dam
(BR) ELEPHANT BUTTE
34,500 Hp Installed
34,500 Hp Ultimate
(BD) POSSUM KINGDOM
34,000 Hp Installed
51,000 Hp Ultimate
(CE) DENISON
59,000 Hp Installed
56,000 Hp on Order
283,040 Hp Ultimate
(CE) FORT GIBSON
64,000 Hp on Order
96,000 Hp Ultimate
(CE) NARROWS DAM
24,000 Initial
36,000 Ultimate
(LC) BUCHANAN
34,600 Hp on Installed
17,300 Hp on Order
51,900 Hp Ultimate
(LC) INKS
16,000 Hp Installed
16,000 Hp Ultimate
(LC) MARSHALL FORD
90,000 Hp Installed
90,000 Hp Ultimate
(LC) TOM MILLER
20,000 Hp Installed
20,000 Hp Ultimate
U.S. BUREAU OF RECLAMATION
1. SHOSHONE 20,000 Hp Ultimate, 20,000 Hp Installed
2. HEART MT, 8,300 Hp Ultimate, 8,300 Hp on Order
3. BOYSEN, 21,000 Hp Ultimate, Not Ordered
4. SEMINOE, 45,000 Hp Ultimate, 45,000 Hp Installed
5. KORTES, 55,500 Hp Ultimate, 55,500 Hp on Order
6. MARY'S LAKE, 11,300 Hp Ultimate, 11,300 Hp on Order
7. ESTES, 6,3,000 Hp Ultimate, 6,3,000 Hp on Order
LEGEND
BR U.S. Bureau of Reclamation
CE U.S. Corps of Engineers
II Imperial Irrigation District
PV Platte Valley Public Power and Irrigation District
LR Loup-River Public Power District
CN Central-Nebraska Public Power and Irrigation District
GD Grand-River Dam Authority
LC Lower Colorado River Authority
BD Brazos-River Conservation and Reclamation District
TVA PROJECTS LEGEND
A KENTUCKY, 220,000 Hp Ultimate, 220,000 Hp Installed
B PICKWICK, 288,000 Hp Ultimate, 192,000 Hp Installed
C WILSON, 610,000 Hp Ultimate, 470,000 Hp Installed
D WHEELER, 360,000 Hp Ultimate, 180,000 Hp Installed
E GUNTERSVILLE, 136,000 Hp Ultimate, 102,000 Hp Installed
F HALES BAR, 44,000 Hp Ultimate, 44,000 Hp Installed
G CHICKAMAUGA, 144,000 Hp Ultimate, 108,000 Hp Installed
H WATTS BAR, 210,000 Hp Ultimate, 210,000 Hp Installed
I NORRIS, 132,000 Hp Ultimate, 132,000 Hp Installed
J FORT LOUDOUN, 176,000 Hp Ultimate, 88,000 Hp Installed
K CHEROKEE, 166,000 Hp Ultimate, 83,000 Hp Installed
L S. HOLSTON, 48,500 Hp Ultimate, 48,500 Hp Installed
M WATAUGA, 69,000 Hp Ultimate, 69,000 on Order
N DOUGLAS, 166,000 Hp Ultimate, 83,000 Hp Installed
O FONTANA, 274,000 Hp Ultimate, 183,000 Hp Installed
P APALACHIA, 106,000 Hp Ultimate, 106,000 Hp Installed
Q HIWASSEE, 160,000 Hp Ultimate, 80,000 Hp Installed
R CHATUGE, 10,700 Hp Ultimate
S NOTTELY, 13,400 Hp Ultimate
T OCOEE NO.3, 33,500 Hp Ultimate, 33,500 Hp Installed

Hydroelectric Projects Constructed and Operated by Government Agencies

Government agency	Project	State	River	Ultimate capacity, hp	Initial capacity, hp	Installed capacity, hp	On order, hp
U. S. Bureau of Reclamation	Grand Coulee	Wash.	Columbia	3,012,000	523,000	1,513,000	990,000
	Hungry Horse	Mont.	S. F. Flathead	420,000	420,000	.....	.....
U. S. Corps of Engineers	Bonneville	Ore. & Wash.	Columbia	729,000	137,000	729,000	.....
	Detroit	Ore.	Santiam	202,500	135,000	.....	.....
	McNary Dam	Ore. & Wash.	Columbia	1,558,200	445,200	.....	.....
U. S. Bureau of Reclamation	Anderson Ranch	Idaho	Boise	55,500	37,000	.....	37,000
	Minidoka	Idaho	Snake	26,500	9,000	19,500	.....
	Shasta	Calif.	Sacramento	522,000	419,000	419,000	103,000
	Keswick	Calif.	Sacramento	102,000	102,000	.....	102,000
Imperial Irrigation District	Drop No. 3	Calif.	All Am. Canal	15,000	7,500	7,500	.....
	Drop No. 4	Calif.	All Am. Canal	28,300	13,300	13,300	15,000
U. S. Bureau of Reclamation	Parker Dam	Ariz. & Calif.	Colorado	160,000	120,000	160,000	.....
	Davis Dam	Ariz. & Calif.	Colorado	311,000	311,000	.....	311,000
	Boulder Dam	Ariz. & Nev.	Colorado	1,835,000	522,000	1,435,000	.....
	Elephant Butte	N. M.	Rio Grande	34,500	34,500	34,500	.....
	Green Mountain	Colo.	Blue	30,000	30,000	30,000	.....
	Estes	Colo.	Big Thompson	63,000	63,000	.....	63,000
	Mary's Lake	Colo.	Big Thompson	11,300	11,300	.....	11,300
	Kortes	Wyo.	North Platte	55,500	55,500	.....	55,500
	Shoshone	Wyo.	Shoshone	20,000	20,000	20,000	.....
	Heart Mountain	Wyo.	Shoshone	8,300	8,300	.....	8,300
	Boysen	Wyo.	Big Horn	21,000	21,000	.....	.....
	Seminoe	Wyo.	North Platte	45,000	45,000	45,000	.....
U. S. Corps of Engineers	Fort Peck	Mont.	Missouri	150,000	70,000	70,000	.....
Platte Valley Pub Pr & Irr Dist	Sutherland	Neb.	North Platte	35,000	35,000	35,000	.....
Consumer Public Power Dist	Spencer	Neb.	Niobrara	3,740	1,540	1,540	2,200
Loup River Public Power Dist	Monroe	Neb.	Loup	9,600	9,600	9,600	.....
	Columbus	Neb.	Loup	54,000	54,000	54,000	.....
Central Neb. Pub Pr & Irr Dist	Jeffery Canyon	Neb.	Platte	26,000	26,000	26,000	.....
	Johnson No. 1	Neb.	Platte	26,000	26,000	26,000	.....
	Johnson No. 2	Neb.	Platte	50,000	25,000	25,000	.....
U. S. Corps of Engineers	St. Mary's Falls	Mich.	St. Mary's	72,750	23,925	.....	23,925
	Norfolk	Ark.	North Fork	168,000	42,000	42,000	42,000
	Narrows	Ark.	Little Missouri	36,000	21,000	.....	21,000
Grand River Dam Authority	Pensacola Dam	Okla.	Grand	100,000	80,000	100,000	.....
U. S. Corps of Engineers	Fort Gibson	Okla.	Grand	96,000	61,000	.....	61,000
	Dennison Dam	Okla. & Texas	Red	283,080	59,080	59,080	56,000
Lower Colorado River Authority	Buchanan Dam	Texas	Colorado	51,900	34,600	34,600	17,300
	Tom Miller	Texas	Colorado	20,000	20,000	20,000	.....
	Inks Dam	Texas	Colorado	16,000	16,000	16,000	.....
	Marshall Ford	Texas	Colorado	90,000	90,000	90,000	.....
Brazos Riv Conser & Reclam Dist	Possum Kingdom	Texas	Brazos	51,000	34,000	34,000	.....
U. S. Corps of Engineers	Wolf Creek	Ky.	Cumberland	375,000	187,500	.....	187,500
Tennessee Valley Authority	Kentucky	Ky.	Tennessee	220,000	176,000	220,000	.....
	Pickwick	Tenn.	Tennessee	288,000	96,000	192,000	.....
	Wilson	Ala.	Tennessee	610,000	206,000	170,000	110,000
	Wheeler	Ala.	Tennessee	360,000	90,000	180,000	180,000
	Guntersville	Ala.	Tennessee	136,000	102,000	102,000	.....
	Hales Bar	Tenn.	Tennessee	44,000	44,000	44,000	.....
	Chickamauga	Tenn.	Tennessee	144,000	108,000	108,000	.....
	Watts Bar	Tenn.	Tennessee	210,000	126,000	210,000	.....
	Norris	Tenn.	Clinch	132,000	132,000	132,000	.....
	Fort Loudoun	Tenn.	Tennessee	176,000	88,000	132,000	44,000
	Cherokee	Tenn.	Holston	166,000	83,000	83,000	.....
	Douglas	Tenn.	French Broad	166,000	83,000	83,000	35,500
	South Holston	Tenn.	South Holston	48,500	48,500	.....	48,500
	Watauga	Tenn.	Watauga	69,000	69,000	.....	69,000
	Fontana	N. C.	Little Tennessee	274,000	183,000	183,000	.....
	Apalachia	Tenn.	Hiwassee	106,000	106,000	106,000	.....
	Hiwassee	N. C.	Hiwassee	160,000	80,000	80,000	.....
	Chatuge	N. C.	Hiwassee	10,700	10,700	.....	.....
	Nottely	Ga.	Nottely	13,100	13,100	.....	.....
	Ocoee No. 3	Tenn.	Ocoee No. 3	33,500	33,500	33,500	.....
U. S. Corps of Engineers	Buggs Island	Va. & N. C.	Roanoke	325,000	172,000	.....	.....
	Central Hill	Tenn.	Carney Fork	187,000	125,000	.....	125,000
	Dale Hollow	Tenn.	Obey	75,000	50,000	50,000	.....
	Allatoona	Ga.	Etowah	152,900	102,900	.....	102,900
	Clark Hill	Ga. & S. C.	Savannah	385,000	220,000	.....	.....
S. Carolina Public Service Auth	Santee-Cooper	S. C.	Santee	213,000	173,000	173,000	.....
Greenwood County Board of Comm	Buzzards	S. C.	Saluda	30,000	22,200	22,200	.....
Total Capacity				15,737,190	7,147,345	10,357,045	2,856,225

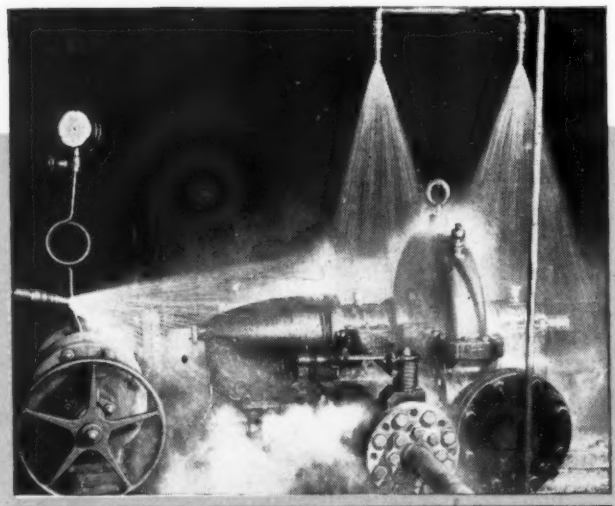
LR Loup-River Public Power District (LOUP RIVER) 20,000 Hp Installed 20,000 Hp Ultimate
CN Central-Nebraska Public Power and Irrigation District
GD Grand-River Dam Authority
LC Lower Colorado River Authority
BD Brazos-River Conservation and Reclamation District
H WATTS BAR, 20,000 Hp Ultimate, 210,000 Hp Installed
I NORRIS, 132,000 Hp Ultimate, 132,000 Hp Installed
J FORT LOUDOUN, 176,000 Hp Ultimate, 88,000 Hp Installed
R CHATUGE, 10,700 Hp Ultimate
S NOTTELY, 13,400 Hp Ultimate
T OCOEE NO 3, 33,500 Hp Ultimate, 33,500 Hp Installed



Where there's NO

COUNT ON

rugged · reliable · economical



Water-test periods running for hours and hours—with turbine *operating* and *standing still*—prove the effectiveness of TYPEE bearing seals against water contamination of the lubricating oil.

Dust-like, hard abrasive sprayed on the TYPEE operating at full speed . . . none of the abrasive entered the bearing housing—governing and overspeed mechanisms operated freely.

DUAL PROTECTION . . .

provides a double line of defense against overspeed. If speed should become excessive, Dual Protection positively shuts off the steam flow by tripping the governor valve and a rugged butterfly valve simultaneously.

WEATHER PROTECTION . . .

Exposure to all conditions—water, dust, and other foreign matter, outdoors or indoors . . . will not impair the operation of TYPEE turbines.

CENTERLINE SUPPORT . . .

The TYPEE method of support allows freedom of expansion and contraction of the casing without disturbing the alignment of the rotor shaft. The casing is positioned at the exhaust end by a kingpin which transmits pipe thrust to the foundation. A flexible channel-beam at the governor end allows for axial expansion.

RUGGED GOVERNOR HOUSING . . .

completely protects the governor assembly and shaft end. The housing is exceptionally strong and will withstand the abuse small turbines sometimes receive.

• • •

Get all the facts! Call your nearest Westinghouse office or write for Booklet B-3896, Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh, 30, Pennsylvania. J-50487-A

SAVE ON SPARE PARTS

Interchangeability of parts between units—even between frame sizes—cuts down your investment in "spares". For example, the entire shaft-governor assembly can be removed from one unit and installed on another, without disturbing the rotors.

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

TIME FOR "TIME OUT"

TYPE E GENERAL-PURPOSE TURBINES

Here's the mechanical drive turbine built to give trouble-free, economical performance for long periods of continuous operation . . . or to assure instant operation as a stand-by drive.

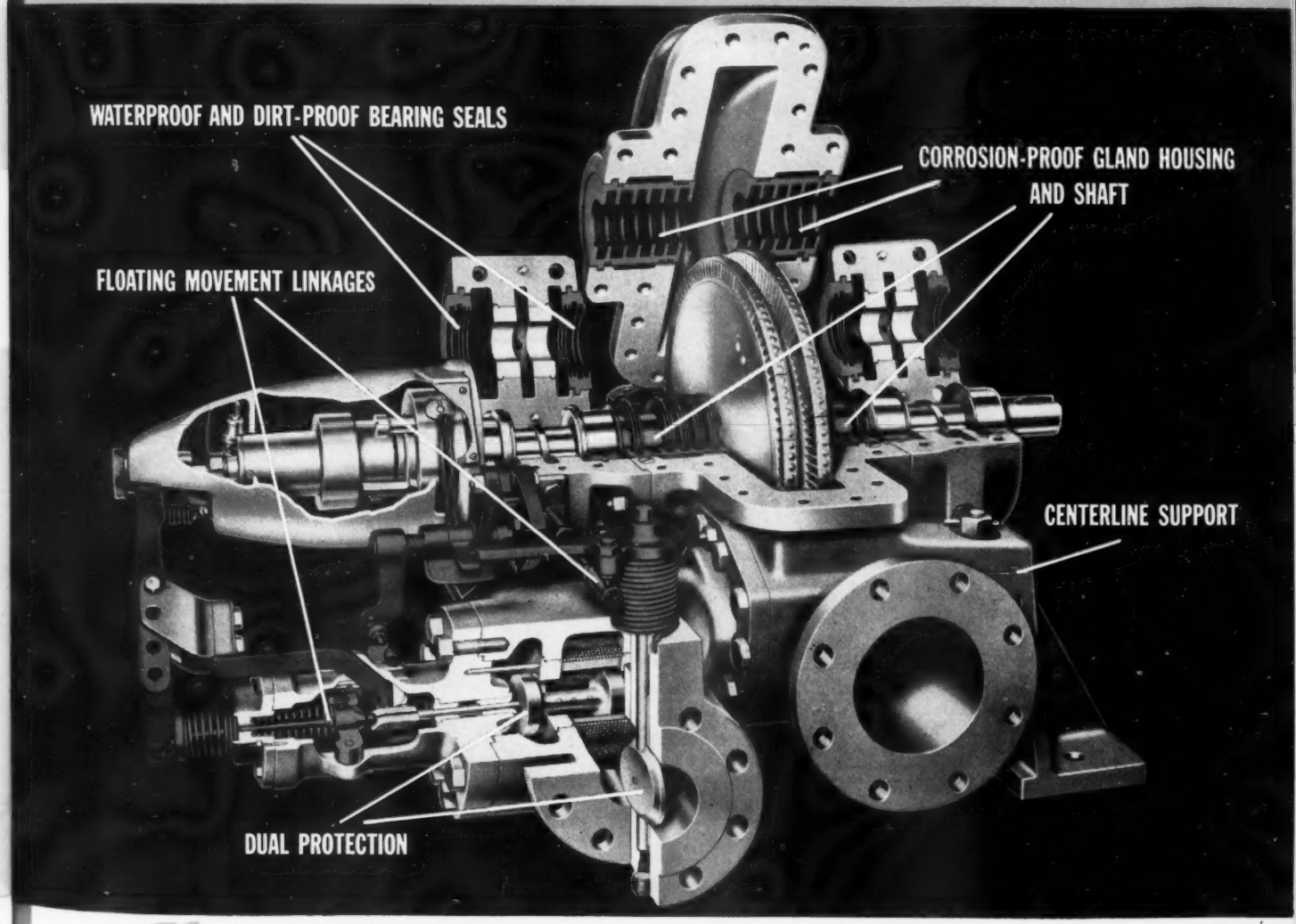
Outstanding features "built in" TYPE E for protection against overspeed, corrosion, misalignment, and interference of operation by water or dirt include: weatherproof bearing seals, corrosion-resisting gland zones, centerline support, Dual Protection against overspeed, floating movement of governing and trip linkages, and parts interchangeability.

Years of experience in building all types of turbines, and "millions of horsepower" of general-purpose turbines . . . plus specialized knowledge of application engineering—are some of the factors that have gone into the TYPE E turbine design and construction.

Get the facts. Call your nearest Westinghouse office for booklet B-3896, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

YOU CAN BE SURE... IF IT'S Westinghouse

CHECK THESE FEATURES!



Steam Headquarters

WESTINGHOUSE

Hydroelectric Projects Built or on Order

Compiled by F A Annett
Associate Editor

Company or government agency	Design or consulting engineers	Project name	[1] New or redeveloped	River	State	Project started, date	[2] Dam type	Crest length, ft	Max height, ft	Date of initial operation	Initial capacity, hp	Added No. of units
NEW ENGLAND STATES												
Public Service Co of N. H.	Nepsco Services, Inc.	Berlin	New	Androscoggin	N.H.	1946	CG	450	48	1947	20,500	
Central Maine Power Co.		Union	Red.		Me.	1946	.....	.....	...	1948	23,200	
Bangor Hydro-Electric Co.	Bangor Hydro-Elec Co.	Milford No. 4A	Red.	Penobscot	Me.	1948	.....	.....	...	1949	2,600	
Great Northern Paper Co.		Millinocket	....		Me.	1947	.....	.....	...	1948	8,832	
Bellows Falls Hydro-Elec Corp.	Chas T Main, Inc.	Wilder	Red.	Connecticut	N.H.&Vt.	1947	CG	.....	59	1948	48,000	
Metropolitan District Comm.	Metropolitan Dist Comm.	Oakdale	New	Swift and Ware	Mass.	1947	.....	.....	...	1949	5,227	
Ames Worsted Co.		Upper	Red.		Mass.	1947	.....	.....	...	1948	51	
Ames Worsted Co.		Lower	Red.		Mass.	1947	.....	.....	...	1948	5	
Holyoke Water Power Co.			Red.		Mass.	1947	.....	.....	...	1948	45	
MIDDLE ATLANTIC STATES												
New York Power & Light Corp.		Stewart Bridge	Red.		N.Y.	1947	.....	.....	...	1949	42,500	
Eastern New York Power Co.	W P Creager and Fargo Eng Co.	High Falls	New	Saranac	N.Y.	1947	CG	261	70	1948	12,800	
EAST NORTH CENTRAL STATES												
North Counties Hydro-Electric		Dayton	Red.		Ill.	1947	.....	.....	...	1948	1,350	
The Lenon Co.		Wilmington	....		Ill.	1947	.....	.....	...	1948	776	
Consumers Power Co.		Webber Dam	....		Mich.	1947	.....	.....	...	1948	1,430	
U. S. Corps of Engineers	U. S. Corps of Engineers Erik Floor & Assoc.	St. Mary's Falls	New		Mich.	1947	.....	.....	...	1949	23,925	
Wolverine Power Corp.		Secord	....		Mich.	1947	.....	.....	...	1948	2,100	
Presque Isle Elec Cooperative		Tower	New		Mich.	1947	.....	.....	...	1949	1,800	
Wisconsin River Power Co.	Harza Engineering Co.	Petenwell	New	Wisconsin	Wis.	1947	CG	.....	52	1949	28,800	
Wisconsin River Power Co.	Harza Engineering Co.	Castle Rock	New	Wisconsin	Wis.	1948	CG	.....	38	1950	22,000	
Wisconsin Michigan Power Co.	Mead & Hunt	Way Dam	New	Michigamme	Wis.	1948	.....	.....	...	1949	2,500	
Wisconsin Michigan Power Co.	Mead & Hunt	Big Quinnesec Falls	New	Menominee	Wis.	1948	CG	640	72	1949	22,000	
City of Kaukauna El & Wtr Dept.	Mead, Ward & Hunt	Little Chute	New		Wis.	1946	.....	.....	...	1948	4,980	
Northern Wisconsin Power Co.	Loeb & Eames	Orienta Falls	Red.	Iron	Wis.	1947	CG	267	54	1948	1,150	
Oconto Electric Cooperative	Orbison & Orbison	Stiles	Red.	Oconto	Wis.	1947	Earth	2,000	29	1948	1,500	
WEST NORTH CENTRAL STATES												
Minnesota Power & Light Co.	Ebasco Services, Inc.	Thomson	New	St. Louis	Minn.	1907	CG & EF	.....	...	1910	39,000	
Northwest Paper Co.	Hazlet & Erdal	Cloquet	Red.	St. Louis	Minn.	1948	CG	190	40	1949	4,887	
Consumers Public Power Dist.		Spencer	Red.	Niobrara	Neb.	1947	.....	.....	...	1949	3,040	
SOUTH ATLANTIC STATES												
Carolina Aluminum Co.		Cheoah	New	Little Tennessee	N.C.	....	CG	.....	192	....	108,000	
Nantahala Power & Light Co.			New		N.C.	....	.....	.....	...	1947	2,250	
U. S. Corps of Engineers	U. S. Corps of Engineers Sanderson & Porter	Allatoona	New	Etowah	Ga.	1946	CG	1,325	200	1949	102,900	
U. S. Corps of Engineers	U. S. Corps of Engrs; Chas T Main.	Clark Hill	New	Savannah	Ga.&S.C.	1947	CG	5,660	200	1950	229,000	
The Abney Mills		Newry	Red.		S.C.	1947	.....	.....	...	1948	485	
The Tredegar Co.		Richmond	Red.		Va.	1947	.....	.....	...	1948	383	
EAST SOUTH CENTRAL STATES												
Tennessee Valley Authority	U. S. Corps of Engineers Hugh L Cooper & Co.	Wilson, also Muscle Shoals	New	Tennessee	Ala.	1918	CGG	4,500	95	1926	260,000	
Tennessee Valley Authority	Tennessee Valley Authority	Wheeler	New	Tennessee	Ala.	1933	CGG	6,335	68	1936	90,000	
Tennessee Valley Authority	Tennessee Valley Authority	Fort Loudoun	New	Tennessee	Tenn.	1940	CGG	4,196	122	1943	88,000	
Tennessee Valley Authority	Tennessee Valley Authority	Douglas	New	French Broad	Tenn.	1942	C&E	1,705	202	1943	83,000	
Tennessee Valley Authority	Tennessee Valley Authority	South Holston	New	South Holston	Tenn.	1942	R&E	1,550	290	....	48,500	
Tennessee Valley Authority	Tennessee Valley Authority	Watauga	New	Watauga	Tenn.	1942	R&E	900	318	1949	69,000	
U. S. Corps of Engineers	U. S. Corps of Engrs; Chas T Main.	Center Hill	New	Carney Fork	Tenn.	1942	C&E	2,160	240	1950	125,000	
U. S. Corps of Engineers	U. S. Corps of Engrs; Chas T Main.	Wolf Creek	New	Cumberland	Ky.	1942	C&E	5,700	240	....	187,500	
Alabama Power Co.	Dixie Construction Co.	Mitchell Dam	New	Coosa	Ala.	1921	CG	1,110	106	1923	72,000	
Alabama Electric Cooperative		Andalusia	New		Ala.	1947	.....	.....	...	1948	.....	
WEST SOUTH CENTRAL STATES												
U. S. Corps of Engineers	U. S. Corps of Engrs; Fargo Eng Co.	Fort Gibson	New	Grand	Okla.	1946	CGE	2,850	110	1949	64,000	
U. S. Corps of Engineers	U. S. Corps of Engineers L H Harza Engineering Co.	Norfolk Dam	New	North Fork	Ark.	1940	CG	2,631	233	1944	42,540	
U. S. Corps of Engineers	U. S. Corps of Engrs; Fargo Eng Co.	Narrows Dam	New	Little Missouri	Ark.	1947	CG	941	185	1949	24,000	
U. S. Corps of Engineers	U. S. Corps of Engineers	Dennison Dam	New	Red	Okla. & Texas	1939	EF	23,200	165	1945	59,080	
Lower Colorado River Authority	Lower Colo. River Auth.	Buchanan	New	Colorado	Texas	1936	MA	11,000	146	1938	34,600	
MOUNTAIN STATES												
U. S. Bureau of Reclamation	U. S. Bureau of Reclamation	Anderson Ranch	New	Boise	Idaho	1941	EF	1,350	330	1949	37,000	
U. S. Bureau of Reclamation	U. S. Bureau of Reclamation	Davis Dam	New	Colorado	Ariz. & Nev.	1941	R&E	1,600	135	1950	311,000	
U. S. Bureau of Reclamation	U. S. Bureau of Reclamation	Estes Park	New	Big Thompson	Colo.	1947	.....	.....	...	1949	63,000	
U. S. Bureau of Reclamation	U. S. Bureau of Reclamation	Mary's Lake	New	Big Thompson	Colo.	1947	.....	.....	...	1949	11,250	
U. S. Bureau of Reclamation	U. S. Bureau of Reclamation	Kortes	New	North Platte	Wyo.	1946	CG	.....	230	1949	35,000	
U. S. Bureau of Reclamation	U. S. Bureau of Reclamation	Heart Mt.	New	Shoshone	Wyo.	1946	.....	.....	...	1949	8,000	
U. S. Bureau of Reclamation	U. S. Bureau of Reclamation	Boysen	New	Big Horn	Wyo.	1947	EF	1,000	150	1950	21,000	
Idaho Power Co.	Ebasco Services, Inc.	Lower Salmon	New	Snake	Idaho	1946	CG	700	50	1948	85,800	
Idaho Power Co.	Ebasco Services, Inc.	Bliss	New	Snake	Idaho	1947	CG	500	80	1950	99,000	

[1] The term "New" applies to an entirely new project on a site that has not been developed before. "Redeveloped" indicates a project on a site that has been developed before and now has new wheels, generators and settings, or a new plant.

[2] CG, concrete gravity; CA, concrete arch; C&E, concrete and earth; EF, earth fill; MA, multiple arch; R&E, rock and earth fill; HEF, hydraulic earth fill P&G, piers and gates; CGE, concrete gravity and earth fill; CGG, concrete gravity with gates.

[2] AC —Allis-Chalmers Mfg Co
BL —Baldwin Locomotive Works
IM —I P Morris
JL —James Leffel & Co
MS —S Morgan Smith Co
NN —Newport News Shipbuilding & Dry Dock Co
PW —Pelton Water Wheel Co
W —Woodward Governor Co
L —Lombard Governor Co
CAC —Canadian Allis-Chalmers, Ltd
CBS —Charles Barber & Sons

in the United States and Canada in 1947

Added No. of units	Date of added cap.	Ultimate capacity, hp	No. of units installed	Waterwheel capacity, hp	Waterwheel, type	Speed, rpm	Static head, ft	Design head, ft	[3] Waterwheel manufacturer	[3] Governor manufacturer	Scroll case, concrete or steel	Penstock valve, type	Generator capacity, kva	Synchronizing, automatic or manual	[4] Thrust-bearing location	Design power factor	Kilovolts	Cycles	[3] Generator manufacturer
....	.....	20,500	1	20,500	Francis	128.6	88	83	BL	W	Plate st	Head gt	18,750	Automatic	BG	0.80	6.9	60	GE
....	.....	23,200	2	11,600	Kaplan	225	76	76	MS	W	Concrete	Head gt	12,000	.....	AG	0.70	6.9	60	GE
....	.....	2,600	1	2,600	Kaplan	120	20	20	MS	W	Concrete	Head gt	2,000	Automatic	AG	0.80	4.16	60	GE
....	.....	8,832	6	1,472	Francis	240	24	24	MS	..	Drives pulp grinders								
....	.....	48,000	2	24,000	Kaplan	112.5	53	49	MS	W	Concrete	Head gt	18,000	Manual	BG	0.90	13.8	60	AC
....	.....	5,225	1	5,225	Francis	327	100–178	107	MS	W	.....	Dow-disk	4,375	Auto & man.	AG	0.80	6.9	60	GE
....	.....	515	1	515	Francis	150	18	18	JL	..	Concrete	Head gt	438	Manual	AG	0.80	2.3	60	EM
....	.....	540	1	540	Francis	182	20.5	20.5	JL	..	Concrete	Head gt	438	Manual.	AG	0.80	2.3	60	EM
....	.....	450	1	450	Francis	200	18.5	18.5	JL	..	Concrete	Head gt	Connects to existing generator						
....	.....	42,500	1	42,500	Francis	105.9	.....	97	BL	..	.....	.....	37,500	.....	BG	0.80	13.8	60	GE
....	.....	12,800	2	6,400	Francis	514	.....	270	JL	W	Steel	Gate	5,000	Manual	AG	0.80	6.9	60	EC
....	.....	1,350	1	1,350	Propeller	257	30	30	MS	..	Concrete	Head gt	Connects to existing generator						
....	.....	776	2	388	Francis	83	12	12	JL	..	Concrete	Head gt	Drives mill machinery						
....	.....	1,430	1	1,430	Francis	200	27	27	JL	..	Concrete	Head gt	1,250	.....	AG	0.80	2.5	60	EM
....	.....	72,750	3	6,975	Kaplan	80	23–18	21	AC	..	Concrete	Head gt	5,333	Manual	BG	0.90	13.8	60	GE
			1	3,000	.....	128.5	23–18	21	MS	..	Concrete	Head gt	2,500	Manual	BG	0.80	4.16	60	GE
....	.....	2,100	1	2,100	.....	200	48	48	.....	W	Concrete	Head gt	1,500	Manual	AG	0.80	2.4	60	EM
....	.....	1,800	2	900	Kaplan	150	42	42	MS	..	Concrete	Head gt	750	Manual	AG	0.80	2.4	60	WE
....	.....	28,800	4	7,200	Kaplan	163.6	42	42	MS	W	Concrete	Head gt	6,250	Manual	AG	0.80	7.2	60	GE
....	.....	22,000	5	4,400	Kaplan	150	28	28	MS	W	Concrete	Head gt	3,750	Manual	AG	0.80	4.16	60	AC
....	.....	2,500	1	2,500	Propeller	225	38–15	35	AC	..	Concrete	Head gt	2,250	Manual	AG	0.80	4.16	60	AC
....	.....	33,000	2	11,000	Francis	200	92–85	92	AC	W	Plate st	Head gt	8,900	Automatic	BG	0.90	6.9	60	AC
....	.....	4,980	3	1,660	Kaplan	112.5	14	14	MS	W	Concrete	Head gt	1,375	.....	AG	0.80	2.4	60	EM
....	.....	1,150	1	1,150	Francis	277	55	55	JL	W	Plate st	Head gt	1,000	Manual	AG	1.00	2.4	60	EM
....	.....	2,250	2	750	Kaplan	225	20	20	MS	W	Concrete	Head gt	625	Automatic	AG	0 80	2.4	60	AC
	.....	.....	3	13,000	Francis	375	345–355	355	AC	IM	Plate st	Butterfly	11,250	Manual	AG	0.80	6.6	60	GE
2	1914–18	89,000	2	15,000	Francis	375	345–355	355	IM	IM	Plate st	Butterfly	12,800	Manual	AG	0.80	6.6	60	GE
1	1949	.....	1	20,000	Francis	400	345–355	355	MS	W	Plate st	Butterfly	15,000	Manual	AG	0.80	6.6	60	GE
1	1949	6,437	1	2,500	Kaplan	240	21	21	MS	W	Concrete	Head gt	2,250	Manual	AG	0.80	2.4	60	WE
....	.....	3,740	1	2,200	Kaplan	120	21	21	MS	W	Concrete	Head gt	2,000	Manual	AG	0.80	4.6	60	WE
....	.....	153,000	4	27,000	Francis	.....	188	188	.....	..	.....	.....	.....	Manual	AG	....	.....	..	.....
1	1949	.....	1	45,000	Francis	164	188	188	AC	..	Plate st	Head gt	37,500	Manual	AG	0.80	6.9	60	AC
....	.....	2,250	1	2,250	Impulse	600	.....	935	MS	..	.....	.....	.....	.....	....	....	....	..	EC
....	.....	152,900	2	50,000	Francis	112.5	153–105	135	MS	W	Plate st	Head gt	40,000	Automatic	BG	0.90	13.8	60	WE
....	.....	.....	1	2,900	Francis	450	153–105	135	JL	W	Service unit		2,500	Manual	AG	0.80	2.4	60	WE
....	.....	385,000	4	55,000	Francis	100	150–111	136	.....	..	Plate st	Head gt	44,444	Manual	BG	0.90	13.8	60	.....
....	.....	485	1	485	Francis	180	25	25	JL	..	Concrete	Head gt	Connects to existing GE generator					..	.....
....	.....	383	1	383	Francis	150	27	27	JL	..	Concrete	Head gt	Drives mill machinery			....	.....	..	.....
			4	30,000	Francis	100	95	92	BL	BL	Concrete	Head gt	24,000	Manual	AG	0.90	13.8	60	WE
6	1942&43	610,000	4	35,000	Francis	100	95	92	NN	W&L	Concrete	Head gt	28,000	Manual	AG	0.90	13.8	60	GE
4	1949–51	.....	6	35,000	Francis	100	95	92	AC	W	Concrete	Head gt	28,000	Manual	AG	0.90	13.8	60	AC
			4	35,000	Francis	100	95	92	AC	AC	Concrete	Head gt	28,000	Manual	AG	0.90	13.8	60	AC
5	1936–48	360,000	5	45,000	Propeller	85.7	54–43	48	BL	W	Concrete	Head gt	36,000	Manual	BG	0.90	13.8	60	GE
3	1949–50	.....	3	45,000	Propeller	85.7	54–43	48	BL	W	Concrete	Head gt	36,000	Manual	BG	0.90	13.8	60	GE
2	1948	176,000	2	44,000	Kaplan	105.8	78–60	65	BL	W	Concrete	Head gt	35,500	Manual	BG	0.90	13.8	60	AC
			2	44,000	Kaplan	105.8	78–60	65	BL	W	Concrete	Head gt	35,500	Manual	BG	0.90	13.8	60	AC
1	1948	157,000	2	41,500	Francis	94.7	129–47	100	MS	W	Concrete	Head gt	33,333	Manual	BG	0.90	13.8	60	GE
			1	35,500	Francis	90	95–47	100	MS	W	Concrete	Head gt	28,888	Manual	BG	0.90	13.8	60	GE
....	.....	48,500	1	48,500	Francis	144	252–126	180	MS	..	.....	.....	38,888	Auto & man.	BG	0.90	13.8	60	.....
....	.....	69,000	2	34,500	Francis	200	325–165	216	NN	W	Welded pl st	Butterfly	27,777	Auto & man.	BG	0.90	13.8	60	WE
....	.....	187,000	2	62,500	Francis	105.9	134–206	160	BL	..	Plate st	Head gt	50,000	Manual	BG	0.90	13.8	60	GE
....	.....	375,000	3	62,500	Francis	105.9	111–214	160	.....	..	Plate st	Head gt	50,000	Manual	BG	0.90	13.8	60	.....
1	1949	101,000	3	24,000	Francis	90	75–65	70	AC	AC	Concrete	Head gt	20,000	Manual	AG	0.87	6.6	60	GE
			1	29,000	Francis	90	75–65	70	AC	W	Concrete	Head gt	25,000	Manual	AG	0.87	6.6	60	GE
....	.....	.....	1	2,960	Francis	138.5	40	40	JL	..	Concrete	Head gt	2,500	Manual	AG	0.80	2.3	60	GE
....	.....	96,000	4	16,000	Francis	100	90–56	61	MS	..	Concrete	Head gt	12,500	Auto & man.	BG	0.90	13.8	60	.....
			1	42,000	Francis	128.5	202–132	160	MS	W	Plate st	Head gt	38,890	Manual	BG	0.90	13.8	60	WE
1	1948	168,540	1	540	Francis	750	202–132	160	JL	W	Service unit		500	Manual	AG	0.80	0.48	60	WE
			1	42,000	Francis	128.5	202–132	160	MS	W	Plate st	Head gt	38,890	Manual	BG	0.90	13.8	60	WE
....	.....	36,000	2	12,000	Francis	225	154–98	132	NN	..	Plate st	Head gt	9,444	Manual	BG	0.90	13.8	60	EC
			1	56,000	Francis	90	131–75	103	MS	W	Plate st	Head gt	36,842	Manual	BG	0.95	13.8	60	WE
1	1948	283,080	2	1,040	Francis	90	131–75	103	JL	W	Service unit		750	Manual	AG	0.80	0.48	60	WE
			1	56,000	Francis	90	131–75	103	MS	W	Plate st	Head gt	36,842	Manual	BG	0.95	13.8	60	WE
	1949	51,900	2	17,300	Francis	171.4	133–73	115	NN	W	Plate st	Head gt	12,500	Manual	BG	0.90	6.9	60	WE
			1	17,300	Francis	171.4	133–73	115	BL	W	Plate st	Head gt	12,500	Manual	BG	0.90	6.9	60	WE
....	.....	55,500	2	18,500	Francis	277	330–173	260	JL	W	Cast st	Butterfly	15,000	Manual	AG	0.90	6.9	60	WE
....	.....	311,000	5	62,200	Francis	94.7	147–100	127	BL	..	Plate st	Head gt	45,000	Auto & man.	AG	1.00	13.8	60	GE
....	.....	63,000	3	21,000	Francis	400	563–550	515	AC	..	Plate st	Butterfly	16,667	Auto & man.	AG	0.90	6.9	60	GE
....	.....	11,300	1	11,300	Francis	327	217–207	212	NN	..	Plate st	Head gt	9,000	Automatic	AG	0.90	6.9	60	GE
....	.....	55,500	3	18,500	Francis	240	209–158	200	AC	AC	Plate st	Ring	13,333	Auto & man.	AG	0.90	6.9	60	EC
....	.....	8,300	1	8,300	Francis	450	277	265	MS	W	Plate st	Head gt	6,000	Auto & man.	AG	0.80	2.4	60	EC
....	.....	21,000	2	10,500	Francis	180	112–70	96	NN	W	.....	.....	7,500	Manual	AG	1.00	6.9	60	WE
....	.....	85,800	3	21,000	Propeller	120	55.5	55.5	NN	W	Concrete	Head gt	19,800	Manual	AG	0.86	13.8	60	AC
			1	22,800	Kaplan	120	55.5	55.5	MS	W	Concrete	Head gt	19,800	Manual	AG	0.86	13.8	60	AC
....	.....	132,100	2	32,500	Propeller	128.5	70	70	NN	W	Concrete	Head gt	25,000	Manual	BG	0.86	13.8	60	WE
			1	34,600	Kaplan	128.5	70	70	MS	W	Concrete	Head gt	25,000	Manual	BG	0.86	13.8	60	WE

DEW—Dominion Engineering Works, Ltd
MSC—S Morgan Smith, Canada, Ltd
MSI—S Morgan Smith-Inglis, Ltd
VEW—Vancouver Engineering Works, Ltd
EC —Elliott Co
EM —Electric Machinery Mfg Co

GE —General Electric Co
WE —Westinghouse Electric Corp
CGE —Canadian General Electric Co Ltd
CWC—Canadian Westinghouse Co Ltd
EEC —English Electric Co of Canada, Ltd
OC —Oerlikon, Canada, Ltd

SGE —Swedish General Electric Co Ltd

[4] AG indicates that the thrust bearing is above generator; BG, thrust bearing is below the generator; HS, horizontal-shaft machine.

[5] Units installed in 1923, rated 35,000 hp, have been rebuilt for 44,000 hp.

Hydroelectric Projects Built or on Order

Compiled by F A Annett
Associate Editor

Company or government agency	Design or consulting engineers	Project name	[1] New or redeveloped	River	State	Project started, date	[2] Dam type	Crest length, ft	Max height, ft	Date of initial operation	Initial capacity, hp
MOUNTAIN STATES — *Contd.*											
Idaho Power Co	Ebasco Services, Inc	Upper Malad	New	Malad	Idaho	1946	.....	140	20	1948	12,000
Idaho Power Co	Ebasco Services, Inc	Lower Malad	New	Malad	Idaho	1946	.....	180	10	1949	22,000
Montana Power Co	Ebasco Services, Inc	Kerr	New	Flathead	Mont.	1930	CA	385	200	1938	77,000
Montana Light & Power Co		Troy	New		Mont.	1946	.....	.....	...	1948	.....
Black Hills Power & Light Co		Belle Fourche	New		S.D.	1947	.....	.....	...	1948	.....
Wilson Produce Co	C A Nickerson	Green River	Red.	Green River	Utah	1947	CG	1,000	5	1948	.....
Village of Bonners Ferry	J H Cave & H M Buroker		New		Idaho	1941	Arch	200	90	1941	1,500
PACIFIC COAST STATES											
U. S. Bureau of Reclamation	U. S. Bureau of Reclamation	Grand Coulee	New	Columbia	Wash.	1934	CG	4,500	553	1941	523,000
U. S. Bureau of Reclamation	U. S. Bureau of Reclamation	Yakima Ro a Div	New	Irr Canal	Wash.	....	.....	.....	...	....	7
Pacific Power & Light Co	Ebasco Services, Inc	Merwin (was Ariel)	New	Lewis	Wash.	1929	Arch	752	314	1931	61,000
Eugene Water-Power Board		Leabury	New	McKenzie	Ore.	1927	Roller	330	20	1929	10,000
Eugene Water-Power Board	Cornell, Howland, Hayes, Merryfield	Walterville	Red.	McKenzie	Ore.	1948	.....	.....	...	1949	11,000
California-Oregon Power Co	Pioneer Service & Engrg Co	Toketee Falls	New	North Umpqua	Ore.	1946	EF	500	75	1949	37,200
U. S. Bureau of Reclamation	U. S. Bureau of Reclamation	Shasta	New	Sacramento	Calif.	1928	CG	3,500	560	1944	213,000
U. S. Bureau of Reclamation	U. S. Bureau of Reclamation	Keswick	New	Sacramento	Calif.	1941	CG	1,050	120	1949	102,000
Southern California Edison Co	Stone & Webster Eng Corp; Southern Calif. Edison Co	Big Creek No. 3	New	San Joaquin	Calif.	1921	CA	494	130	1923	105,000
Pacific Gas & Electric Co	Pacific Gas & Electric Co	Rock Creek	New	N F Feather	Calif.	1947	CG	550	120	1950	147,000
Pacific Gas & Electric Co	Pacific Gas & Electric Co	Cresta	New	N F Feather	Calif.	1947	CG	367	103	1949	93,000
Pacific Gas & Electric Co	Pacific Gas & Electric Co	Colgate	Red.	N F Yuba	Calif.	1948	CG	175	41	1949	35 [illegible]
Pacific Gas & Electric Co	Pacific Gas & Electric Co	Electra	Red.	Mokelume	Calif.	1947	Earth	640	120	1948	11[illegible]
Pacific Gas & Electric Co	Pacific Gas & Electric Co	West Point	New	Mokelume	Calif.	1947	CA	420	100	1948	17,[illegible]
City of Pasadena Water Dept	Morris S Jones	Azusa	Red.	San Gabriel	Calif.	1947	.....	.....	...	1949	3,4[illegible]
City of Los Angeles	Dept Power System Eng	Owens River	New	Owens	Calif.	1948	EF	.....	...	1950	150,000
Imperial Irrigation District	U. S. Bureau of Reclamation	Drop No. 4	New	All Am. Canal	Calif.	1937	None	.....	...	1941	13,300
CANADA					Province						
Avon River Power Co	Montreal Engineering Co	Methals	New	Methals	N.S.	1947	EF	1,000	50	1948	4,600
Avon River Power Co	Montreal Engineering Co	Black River Ext	New	Black	N.S.	1941	EF	750	80	1942	4,500
Nova Scotia Power Comm	K E Whitman	Dickie Brook	New	Dickie Brook	N.S.	1947	EF	1,656	41	1948	2,900
Nova Scotia Power Comm	K E Whitman	Deep Brook	New	Mersey	N.S.	1948	EF	2,600	45	1950	12,000
Northern Quebec Power Co	Power Corp of Canada	Quinze	New	Ottawa	Que.	1921	S&R	2,500	60	1923	....
Quebec Hydro-Elec Comm		Beauharnois	New	St. Lawrence	Que.	1929	P&G	4,500	31	1932	440,000
Shawinigan Water & Power Co	Shawinigan Engineering Co	Shawinigan No. 3	New	St. Maurice	Que.	1946	.....	.....	...	1948	195,000
City of Riviere du Loup	Roland & S P Beaulieu		New	Riviere du Loup	Que.	1947	.....	.....	96	1948	.....
Gatineau Power Co	Shawirigan Engineering Co	Farmers Rapids	New	Gatineau	Que.	1926	RE	3,600	56	1927	96,000
Quebec Hydro-Electric Comm	Silas H Woodward	Rapid No. 7	New	Ottawa	Que.	1938	Earth	3,000	80	1941	48,000
Ogilvie Flour Mills	R A Rankin Co	Royal Mill	New	St. Lawrence	Que.	1948	.....	.....	...	1949	3,200
Lower St. Lawrence Power Co	Foundation Co of Canada	Lower Metis	New	Metis	Que.	1945	CG	75	77	1947	6,000
Town of Jonquiere			New		Que.	1947	.....	.....	...	1948	4,200
Hydro-Elec Power Comm of Ont	Hydro-Elec Power Comm of Ont	Des Joachims	New	Ottawa	Ont.	1947	CG	5,500	165	1950	496,000
Hydro-Elec Power Comm of Ont	Hydro-Elec Power Comm of Ont	Aquasabon	New	Aquasabon	Ont.	1946	CG	950	110	1948	55,000
Hydro-Elec Power Comm of Ont	Hydro-Elec Power Comm of Ont	Decew Falls Ext	New	Welland Canal	Ont.	1941	None	.....	...	1943	72,000
Hydro-Elec Power Comm of Ont	Hydro-Elec Power Comm of Ont	Stewartville	New	Madawaska	Ont.	1945	CG	1,300	200	1948	56,000
Hydro-Elec Power Comm of Ont	Hydro-Elec Power Comm of Ont	Tunnel	New	Mississagi	Ont.	1947	CG	905	230	1949	58,000
Hydro-Elec Power Comm of Ont	Hydro-Elec Power Comm of Ont	Pine Portage	New	Nipigon	Ont.	1947	CG	3,000	150	1950	82,000
Hydro-Elec Power Comm of Ont	Hydro-Elec Power Comm of Ont	Ear Falls	New	English	Ont.	1936	CG	60	46	1937	10,000
Hydro-Elec Power Comm of Ont	H G Acres & Co	Chenaux	New	Ottawa	Ont.&Que.	1948	CG	4,000	70	1951	126,000
Gananoque Elec Lt & Wtr Supply Co	H G Acres & Co	Jones Falls	New	Rideau Canal	Ont.	1946	.....	.....	...	1947	1,350
Town of Bracebridge	H G Acres & Co	High Falls	New	Muskoka	Ont.	1946	CG	230	20	1947	1,250
Abitibi Power & Paper Co		Iroquois Falls	New	Abitibi	Ont.	1947	.....	.....	...	1947	12,500
City of Winnipeg	Winnipeg Engineering Dept	Slave Falls	New	Winnipeg	Man.	1929	.....	.....	...	1931	24,000
Northwestern Power Co	Power Corp of Canada	Seven Sisters	New	Winnipeg	Man.	1929	CG	620	80	1931	112,500
Churchill River Power & Lt Co		Island Falls	New	Churchill	Sask.	1936	.....	.....	...	1937	57,000
Canadian Dept of Mines & Resources	Montreal Engineering Co	Snare River	New	Snare	N W.T.	1946	EF	900	65	1948	8,400
Calgary Power Co	Montreal Engineering Co	Barrier	New	Kananaskis	A.t.	1945	EF	1,800	150	1947	13,500
Bridge River Power Co	Shawinigar Engineering Co; B. C. Elec Co Engrg Staff	Bridge River	New	Bridge	B.C.	1946	EF	1,000	60	1948	62,000
Powell River Co		Lois River	New	Lois	B.C.	1929	CA	640	170	1931	24,000
British Columbia Power Comm	H G Acres Co	John Hart	New	Campbell	B.C.	1945	CG	2,900	140	1947	56,000
City of Nelson	A C R Yuill	Municipal Hydro Pl	New		B.C.	....[illegible]	CG	250	33	....	6,7[illegible]
West Kootenay Power & Lt Co	West Kootenay Pr & Lt Co	Goat River	New	Goat	B.C.	1933	Arch	134	70	1933	1,0[illegible]

[1] The term "New" applies to an entirely new project on a site that has not been developed before. "Redeveloped" indicates a project on a site that has been developed before and now has new wheels, generators and settings, or a new plant.

[2] CG, concrete gravity; CA, concrete arch; C&E concrete and earth; EF, earth fill; MA, multiple arch; R&E, rock and earth fill; HEF, hydraulic earth fill; P&G, piers and gates; CGE, concrete gravity and earth fill; CGG, concrete gravity with gates.

[3] AC —Allis-Chalmers Mfg Co
BL —Baldwin Locomotive Works
IM —I P Morris
JL —James Leffel & Co
MS —S Morgan Smith Co
NN —Newport News Shipbuilding & Dry Dock Co
PW —Pelton Water Wheel Co
W —Woodward Governor Co
L —Lombard Governor Co
CAC —Canadian Allis-Chalmers, Ltd
CBS —Charles Barber & Sons

in the United States and Canada in 1947

Initial capacity, hp	Added cap. No. of units	Date of added cap.	Ultimate capacity, hp	No. of units installed	Waterwheel capacity, hp	Waterwheel, type	Speed, rpm	Static head, ft	Design head, ft	[3] Waterwheel manufacturer	[2] Governor manufacturer	Scroll case, concrete or steel	Penstock valve, type	Generator capacity, kva	Synchronizing, automatic or manual	[4] Thrust-bearing location	Design power factor	Kilovolts	Cycles	[5] Generator manufacturer
12,000	...	.....	12,000	1	12,000	Francis	225	124	124	AC	W	Plate st	Head gt	8,000	Automatic	AG	0.86	6.9	60	AC
22,000	...	.....	22,000	1	22,000	Francis	208	157	157	AC	W	Plate st	Head gt	15,500	Automatic	AG	0.86	13.8	60	AC
77,000	1	1948	154,000	1	77,000	Francis	112.5	191	189	NN	W	Plate st	Head gt	56,000	Manual	BG	0.90	13.8	60	WE
				1	77,000	Francis	112.5	191	189	NN	W	Plate st	Head gt	56,000	Manual	BG	0.90	13.8	60	WE
.....	...	.....	.....	1	5,280	Francis	360	150	150	MS	..	Plate st	Head gt	4,375	Manual	AG	0.80	2.4	60	GE
.....	...	.....	.....	1	500	Francis	360	40	40	JL	..	Concrete	Head gt	Connects to existing EM generator			.....	..	.....	.....
.....	...	.....	.....	1	180	Francis	84	9	9	JL	..	Concrete	Head gt	Drives centrifugal pump			.....	.....	..	.....
1,500	...	1948	3,000	2	1,500	Francis	720	212	200	JL	W	Concrete	Head gt	1,250	Manual	AG	0.80	2.5	60	EM
				9	165,000	Francis	120	368	300	NN	W	Cast st	Head gt	120,000	Auto & man.	AG	1.00	13.8	60	WE
523,000	6	1949–50	3,000,012	2	14,000	Francis	400	368	300	PW	W	Service unit	Head gt	10,000	Auto & man.	AG	0.80	2.4	60	WE
				6	165,000	Francis	120	368	300	NN	W	Cast st	Head gt	120,000	Auto & man.	AG	1.00	13.8	60	WE
75	...	.....	750	2	375	Francis	1000	96	96	JL	..	Cast iron	Head gt	Drives Peerless centrifugal pumps			.....	..	.....	.....
				1	61,600	Francis	240	.....	190	MS	W	Plate st	Head gt	45,000	Manual	BG	0.80	13.8	60	WE
61,000	1	1948	252,400	1	1,050	Francis	.....	.....	190	JL	W	.....	House unit	1,250	Manual	AG	0.80	2.4	60	GE
				1	63,600	Francis	240	.....	190	MS	W	Plate st	Head gt	56,250	Manual	BG	0.80	13.8	60	WE
10,000	1	1949	20,000	1	10,000	Francis	225	89–80	88	MS	MS	Concrete	Head gt	7,500	Manual	AG	1.00	11.5	60	WE
				1	10,000	Francis	225	89–80	88	MS	W	Concrete	Head gt	9,375	Manual	AG	0.80	11.5	60	AC
11,000	...	.....	11,000	1	11,000	Kaplan	171.4	56–41	55	BL	W	Concrete	Head gt	9,412	Automatic	AG	0.85	11.5	60	GE
37,200	...	.....	55,800	2	18,600	Francis	400	471–406	452	MS	W	Plate st	Butterfly	16,667	Automatic	AG	0.85	6.9	60	AC
213,000	1	1948	522,000	4	103,000	Francis	150	480–234	330	AC	AC	Plate st	Head gt	75,000	Auto & man.	AG	1.00	13.8	60	GE
				2	3,500	Francis	600	480–234	330	JL	W	Cast st	Head gt	2,500	Auto & man.	AG	0.80	2.4	60	GE
				1	103,000	Francis	150	480–234	330	AC	AC	Plate st	Head gt	75,000	Auto & man.	AG	1.00	13.8	60	GE
102,000	...	.....	103,800	3	34,600	Francis	94.7	102–46	90	MS	W	Concrete	Head gt	25,000	Auto & man.	AG	1.00	6.9	60	GE
105,000	1	1948	177,000	3	[5]44,000	Francis	428	830	760	PW	W	Cast st	Butterfly	33,000	Manual	AG	0.80	11.00	60	WE
				1	45,000	Francis	450	830	760	PW	W	Cast st	Butterfly	35,000	Manual	AG	0.80	12.5	60	WE
147,000	...	.....	147,000	2	73,500	Francis	240	535	481	NN	W	Plate st	Butterfly	63,000	Auto & man.	AG	0.90	13.8	60	WE
93,000	...	.....	93,000	2	46,500	Francis	180	290	254	PW	W	Plate st	Butterfly	37,500	Auto & man.	AG	0.90	11.5	60	GE
35,000	...	.....	35,000	1	35,000	Francis	450	852	728	PW	W	Plate st	Butterfly	30,000	Auto & man.	AG	0.80	11.5	60	WE
112,500	...	.....	112,500	3	37,500	Impulse	225	1268	1223	PW	W	None	Butterfly	33,000	Auto & man.	HS	0.90	13.8	60	AC
17,000	...	.....	17,000	1	17,000	Francis	300	320	312	AC	W	Plate st	Butterfly	16,000	Auto & man.	AG	0.85	13.8	60	AC
3,400	...	.....	3,400	1	3,400	Francis	720	.....	395	JL	W	Plate st	Head gt	3,000	Automatic	...	1.00	2.4	60	AC
150,600	plants 1, 2 & 3		153,600	3	51,200	Francis	400	820–720	743	PW	W	Cast st	.....	37,500	Automatic	AG	1.00	11.5	60	WE
13,300	1	1949	28,300	1	13,300	Propeller	150	56–49	51	NN	W	Concrete	Head gt	12,000	Manual	AG	0.80	6.9	60	EC
				1	15,009	Kaplan	138.5	56–49	51	AC	W	Concrete	Head gt	12,500	Manual	AG	0.80	6.9	60	GE
4,600	...	.....	4,600	1	4,600	Propeller	240	51–48	45	DEW	W	Concrete	Head gt	4,000	Automatic	AG	0.85	6.9	60	CWC
4,500	1	1949	9,000	1	4,500	Francis	257	203	185	DEW	DEW	Plate st	Butterfly	3,500	Manual	AG	0.80	6.9	60	CWC
				1	4,500	Francis	450	203	185	DEW	W	Plate st	Butterfly	4,200	Manual	AG	0.85	6.9	60	CWC
2,900	...	.....	4,350	2	1,450	Francis	900	273	261	CAC	W	Cast st	Gate	1,500	Manual	HS	0.80	2.4	60	CWC
12,000	...	.....	12,000	2	6,000	Kaplan	200	46	46	MSC	W	Concrete	Head gt	5,000	Automatic	AG	0.80	6.9	60	CWC
.....	4	1923–28	122,000	4	10,000	Francis	.....	70–90	70	DEW	..	Plate st	Head gt	10,000	Manual	AG	0.80	11.00	25	SEC
	1	1950	.....	1	35,000	Francis	107	70–90	90	CAC	W	Welded st	Head gt	32,500	Manual	AG	0.80	11.00	25	CGE
				6	53,000	Francis	75	83	80	DEW	DEW	Concrete	Head gt	43,886	Manual	BG	0.85	13.2	25	1-OC 5-CGE
440,000	7	1932–41	758,000	2	8,000	Francis	180	83	80	DEW	DEW	Concrete	Head gt	7,200	Manual	BG	0.90	13.2	60	CGE
	1	1948	.....	7	53,000	Francis	75	83	80	DEW	DEW	Concrete	Head gt	46,625	Manual	BG	0.90	13.2	60	CGE
				1	53,000	Francis	75	83	80	DEW	DEW	Concrete	Head gt	46,625	Manual	BG	0.90	13.2	60	CGE
195,000	...	.....	195,000	3	65,000	Francis	120	150–130	145	DEW	W	Plate st	Head gt	62,500	Auto & man.	AG	0.80	13.8	60	CGE
.....	...	.....	.....	1	1,800	Francis	60	96	96	MSC	W	Concrete	Head gt	1,500	Manual	AG	0.80	2.4	60	CGE
96,000	1	1947	120,000	4	24,000	Francis	90	66	66	DEW	W	Plate st	Head gt	25,000	Manual	AG	0.85	6.6	60	CGE
				1	24,000	Francis	90	66	66	DEW	W	Plate st	Head gt	22,500	Manual	AG	0.85	6.6	60	CGE
48,000	1	1948	64,000	3	16,000	Francis	115.4	52–71	68	DEW	W	Concrete	Head gt	15,000	Manual	AG	0.80	13.8	25	CWC
				1	16,000	Francis	115.4	52–71	68	DEW	W	Concrete	Head gt	15,000	Manual	AG	0.80	13.8	25	CWC
3,200	...	.....	3,200	2	1,600	Propeller	180	24	24	DEW	..	Concrete	Head gt	1,420	Manual	AG	0.60	2.3	60	CWC
6,000	...	.....	6,000	1	6,000	Francis	200	75	75	MSC	W	Plate st	Head gt	5,000	Manual	AG	0.85	4.16	60	CWC
4,200	...	.....	4,200	1	4,200	Kaplan	257	47	47	MSC	..	Concrete	Head gt	3,125	Manual	AG	0.80	2.75	60	CGE
496,000	...	.....	496,000	8	62,000	Francis	105.9	135–124	130	DEW	W	Plate st	Head gt	50,000	Manual	AG	0.90	13.8	60	CWC
55,000	...	.....	55,000	2	27,500	Francis	257	300–275	300	DEW	W	Plate st	Butterfly	22,500	Manual	AG	0.90	13.8	60	CWC
72,000	1	1947	147,000	1	72,000	Francis	150	275–267	265	CAC	W	Plate st	Head gt	48,500	Manual	AG	0.85	13.2	25	CGE
				1	75,000	Francis	166.7	275–267	265	CAC	W	Plate st	Head gt	64,000	Manual	AG	0.85	13.2	25	CGE
56,000	...	.....	56,000	2	28,000	Francis	163.6	131–155	148	CAC	W	Plate st	Head gt	24,000	Manual	AG	0.85	13.2	60	CGE
58,000	...	.....	58,000	2	29,000	Francis	211.8	214–219	210	CAC	W	Plate st	Head gt	23,500	Manual	AG	0.90	13.8	60	CWC
82,000	...	.....	164,000	2	41,000	Francis	109.1	110–100	105	CAC	W	Plate st	Head gt	33,000	Automatic	AG	0.90	13.8	60	CWC
				2	5,000	Propeller	180	44–26	36	MSI	W	Concrete	Head gt	4,500	Manual	AG	0.85	6.6	60	OC
10,000	1	1940	25,000	1	7,500	Kaplan	150	44–26	36	MSI	W	Concrete	Head gt	6,000	Manual	AG	0.90	6.6	60	CWC
	1	1948	.....	1	7,500	Kaplan	150	44–26	36	MSC	W	Concrete	Head gt	6,000	Manual	AG	0.90	6.6	60	CWC
126,000	...	.....	168,000	6	21,000	Propeller	94.7	41–25	40	DEW	W	Concrete	Head gt	17,000	Manual	AG	0.90	13.8	60	.....
1,200	...	.....	3,440	1	1,130	Francis	514	62–56	58	CBS	W	Plate st	Head gt	1,000	Manual	HS	0.80	2.3	60	CGE
1,200				1	250	Francis	.....	62–56	58	CBS	W	Plate st	Head gt	225	Manual	HS	0.80	2.3	60	CGE
12,500	...	.....	2,400	1	1,200	Francis	360	51–44	44	CBS	W	Plate st	Head gt	1,000	Automatic	HS	0.80	6.9	60	CGE
24,000	...	.....	12,500	5	2,500	Francis	240	42.5	42.5	MSC	..	Cast st	Head gt	2,250	Manual	HS	0.90	12.5	60	CWC
	2	1948	96,000	4	12,000	Propeller	94.7	33–22	30	DEW	W	Concrete	Head gt	10,000	Manual	AG	1.00	6.6	60	SGE
				4	12,000	Propeller	94.7	33–22	30	DEW	W	Concrete	Head gt	10,000	Manual	AG	1.00	6.6	60	CGE
112,500	2	1949–50	225,000	3	37,500	Propeller	138.5	66	66	1-AC, 1-DEW, 1-MS, 3-W			Head gt	32,500	Manual	AC	0.85	11.00	60	CGE
				2	37,500	Propeller	128.6	66	66	DEW	W	Concrete	Head gt	32,500	Manual	AG	0.85	11.0	60	CGE
57,000	5	1937–39	114,000	5	19,000	Propeller	150	56	56	DEW	W	Concrete	Head gt	18,000	Manual	AG	0.90	6.6	60	CGE
	1	1948	.....	1	19,000	Propeller	150	56	56	DEW	W	Concrete	Head gt	18,000	Manual	AG	0.90	6.6	60	CGE
8,490	...	.....	8,490	1	8,300	Francis	128.5	56	56	MSC	W	Plate st	Head gt	7,000	Manual	AG	1.00	6.9	60	CGE
				1	190	Francis	900	56	56	CBS	W	Plate st	Head gt	150	Manual	HS	0.80	0.55	60	CGE
13,500	...	.....	13,500	1	13,500	Francis	225	151–126	135	DEW	DEW	Plate st	Head gt	11,250	Automatic	AG	0.85	13.2	60	CWC
620,000	2	1949	620,000	1	62,000	Impulse	300	.....	1,130	PW	..	.....	.....	50,000	.....	AG	0.90	13.8	60	CWC
				2	62,000	Impulse	300	.....	1,130	VEW		.....	.....	50,000	.....	AG	0.90	13.8	60	CWC
48,000	1	1947	48,000	2	24,000	Francis	333.3	425–300	375	DEW	W	Plate st	Johnson	18,000	Manual	AG	0.80	6.6	60	CGE
168,000	2	1949–50	168,000	2	28,000	Francis	327.3	480–394	390	DEW	W	Plate st	Butterfly	25,000	Manual	AG	0.80	13.8	60	CWC
				2	28,000	Francis	327.3	480–394	390	DEW	W	Plate st	Butterfly	25,000	Manual	AC	0.80	13.8	60	CWC
6,750	1	1949	13,500	1	6,750	Francis	164	73	70	CAC	W	Plate st	Head gt	6,000	Manual	AG	0.80	12.0	60	CGE
1,850	1	1948	1,850	1	250	Francis	.....	69	69	CAC	CAC	Cast st	Head gt	200	Manual	HS	0.80	2.3	60	CGE
				1	800	Francis	600	69	69	CBS	CAC	Plate st	Head gt	600	Automatic	HS	0.80	2.3	60	CGE
				1	800	Francis	600	69	69	CBS	CAC	Plate st	Head gt	600	Automatic	HS	0.80	2.3	60	CGE

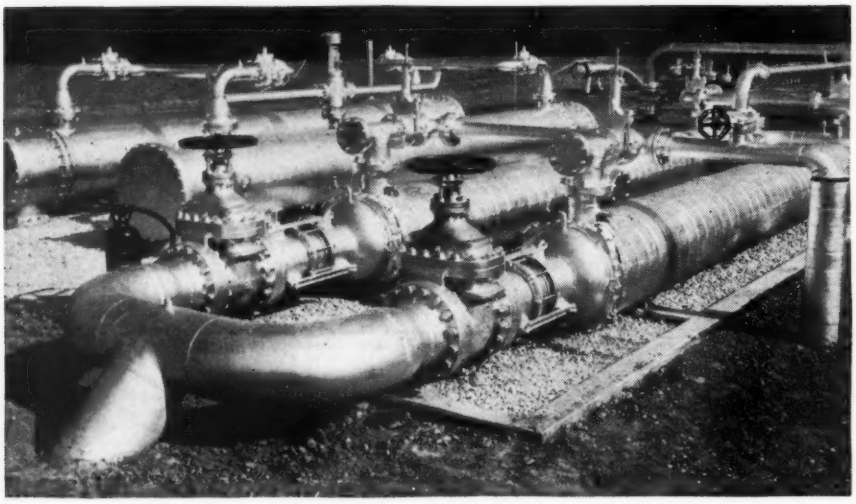
DEW—Dominion Engineering Works, Ltd
MSC—S Morgan Smith, Canada, Ltd
MSI—S Morgan Smith-Inglis, Ltd
VEW—Vancouver Engineering Works, Ltd
EC—Elliott Co
EM—Electric Machinery Mfg Co
GE—General Electric Co
WE—Westinghouse Electric Corp
CGE—Canadian General Electric Co Ltd
CWC—Canadian Westinghouse Co Ltd
EEC—English Electric Co of Canada, Ltd
OC—Oerlikon, Canada, Ltd
SGE—Swedish General Electric Co Ltd

[4] AG indicates that the thrust bearing is above generator; BG, thrust bearing is below the generator; HS, horizontal-shaft machine.

[5] Units installed in 1923, rated 35,000 hp, have been rebuilt for 44,000 hp.

POWER ENGINEERS' NOTEBOOK

PLANT-TESTED IDEAS TO SOLVE PROBLEMS OF DESIGN, OPERATION AND MAINTENANCE



SLIP JOINTS PREVENT EXPANSION TROUBLES

HEAT EXCHANGERS must be mounted flexibly so expansion of the unit will not cramp or distort connections and fittings for either circuit passing through the shell. On the crude-oil pipeline, right, the flow of oil through the line cools the engine jacket-cooling water. Here the heat exchanger shells are mounted with slip joints on the downstream end. Three sets of restraining links set across the slip joint take any end thrust that develops and prevents the line pressure from forcing the unit apart. The links are set up when the unit is cold, thus allowing for expansion above that point without binding.

The lines carrying the cooling water to the coils within the exchanger are set some four feet from the shell and enter by way of a reverse-U swing so torque in the horizontal pipe can absorb dimensional changes in exchanger shell length.

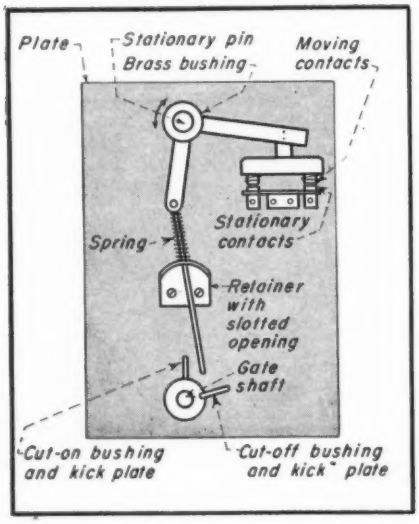
Use of flange joints on the water circuit and slip joints on the oil leads permits a shell to be withdrawn from service in a minimum of time by loosening only a few bolts. This work does not disturb the main control valves and the second section of the heat exchanger installation, permitting operation to continue during maintenance work.

ELTON STERRETT *Houston, Texas*

The Editors Invite Contributions

Here's your chance to cash in on one of those professional tricks you have used in your plant. POWER pays $20 for each item published here on problems in design, operation and maintenance. Your contribution need be in rough form only—just set down all facts with sketches in pencil. We will do any editing that is needed.

AUTOMATIC SWITCH CONTROLS ALARM CIRCUIT



A PLANT burning hogged fuel moved its wood from the storage vault by a belt conveyor. Frequently the wood would arch over at the vault discharge leaving the conveyor empty. Since this fuel fed three boilers it was important that the fireman know about the stoppage as soon as it occurred. The author developed the mechanical switch, at left, to operate a bell alarm.

A swinging gate in the conveyor trough operates this switch. With a clean belt the gate hangs vertically, but when loaded with fuel the belt pushes the gate to a horizontal position. The gate shaft extends through the switch-mounting plate. Two brass bushings mounted on the end of the shaft are locked in position with setscrews. Each bushing carries a kick plate and can be readily positioned in respect to the other and the gate, and adjust the alarm cut-on and cut-off points.

The spring gives the switch a snap action and locks it in position. The gate can swing to and fro a certain amount before causing an operation in either direction. The spring-opposed construction of the moving contact points assures a good contact when the switch closes. The angular arrangement causes a wiping action that cleans the points. The switch may be used in either a circuit-opening or circuit-closing setup, depending on the setup of the alarm circuit selected.

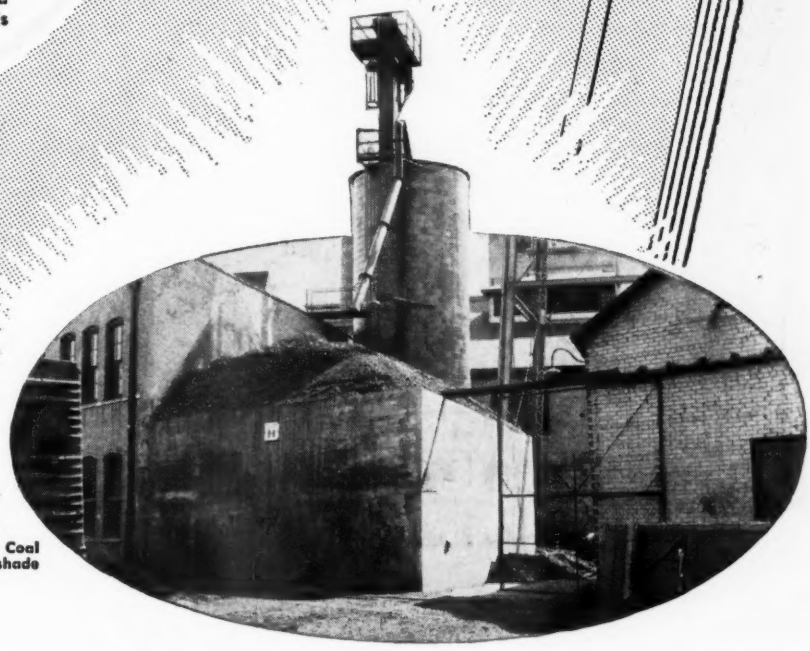
DENARD L GUSLER *Bassetts, Va.*

(*Continued on page* 136)

FAIRFIELD COAL HANDLING EQUIPMENT Introduces TREMENDOUS SAVINGS at this PLANT!

Case Study 153
Fairfield Coal Handling Installation
of
TROY SUNSHADE COMPANY
Troy, Ohio

Send For Your
COPY of Case Study 153
Here is a factual study of the remarkable savings one company experienced when it installed a Fairfield Coal Handling plant. It is yours for the asking.



A general view of the Fairfield Coal Handling installation at Troy Sunshade Company, Troy, Ohio.

TWO PROBLEMS SOLVED at a MINIMUM of COST

When obsolescence and a critical labor shortage "team up" on coal and ash handling, costs are bound to go "sky high". When Troy Sunshade saw these costs were getting out of hand, it called in Fairfield Engineers to study the problem and make a recommendation.

What Fairfield did recommend and install makes interesting reading to everyone with a desire to hold coal and ash handling costs to a minimum. All of the facts . . . comparative costs . . . actual photos of the installation . . . installation diagrams are given in CASE STUDY 153. Send for your copy today.

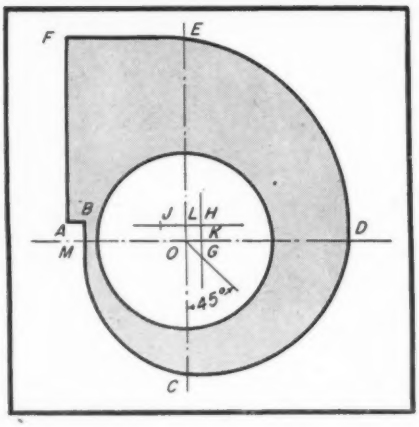
THE FAIRFIELD ENGINEERING COMPANY

BUILDERS OF DEPENDABLE COAL AND ASH HANDLING EQUIPMENT

327 CHICAGO AVENUE . . . . . MARION, OHIO, U. S. A.

 (*Continued from page* 134)

HOW TO DRAW FAN SCROLLS ON LAYOUTS QUICKLY



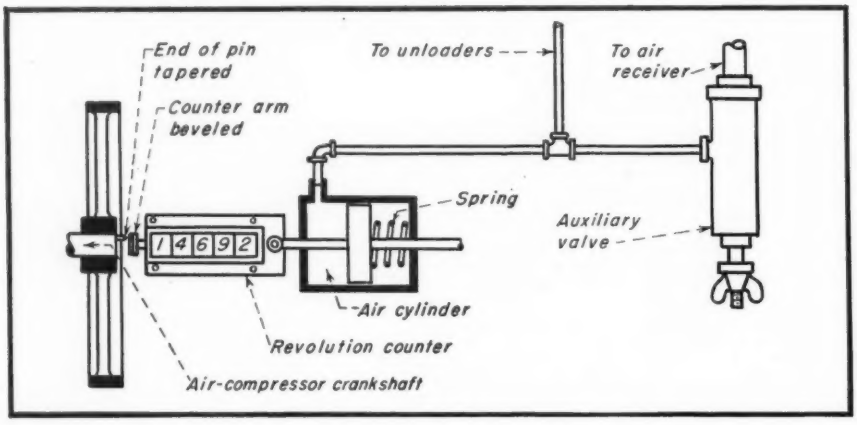
POWER-PLANT and air-conditioning designers frequently need a simple and quick means of drawing an accurate side elevation of a fan. The figure, left, shows one method of doing this with ordinary drafting tools.

From a fan catalog obtain the dimensions *EF*, *OE*, *OC* and *OD*. Step them off to scale from the horizontal and vertical center lines of the fan. Draw 45-degree line through *O* in the quadrant opposite that in which the discharge lies. Assume point *B* to lie about 3 in. in from the edge of the discharge *FA*. Then find a point *G*, on the 45-deg line, such that an arc will pass through *C* and be tangent to a perpendicular dropped through *B*. Draw *MC* using *G* as the center. Through *G* raise a perpendicular. With radius *KD* draw arc *CD* from a center *H* located by trial on the perpendicular. Through *H* draw a horizontal line. With radius *LE*, draw arc *DE*, from a center *J* located by trial on the horizontal. Then draw the circular inlet. Finish the drawing by projecting the various arcs to the discharge *FA*, using straight lines. Centers *G* and *H* will usually lie on about 45-deg lines through *O* while *J* will lie on a line that makes an angle of about 30 deg with *OM*.

This method eliminates French curves, templates and tracing devices with a resultant decrease in drawing time. It can be used for any type discharge, top horizontal, vertical downblast, bottom horizontal, etc. It is easy to use if you remember that the arcs are tangent to perpendiculars to the center lines through points *C*, *D* and *E*. The resulting curve is almost identical with the actual and is suitable for all layout work.

TYLER G HICKS *New York, N. Y.*

REVOLUTION COUNTER METERS THE COMPRESSOR AIR OUTPUT



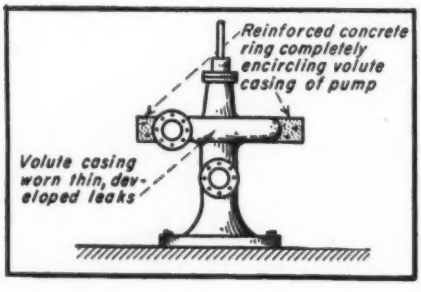
FOR ACCOUNTING PURPOSES it was necessary to get an estimate of the air quantity compressed per month in our plant. Not having air flowmeters at hand we adapted a revolution counter as shown in the sketch, above, to enable closely calculating air amounts.

Our compressors are equipped with diaphragm-type free-air unloaders controlled by an auxiliary valve connected to the air receiver. When the compressors operate unloaded, air pressure develops in the line between the auxiliary valve and the unloaders in the inlet valves. This air pressure has been made to operate a piston carrying the revolution counter located near the end of the crankshaft. When the compressor stops pumping the revolution counter disengages because the air pressure displaces the piston to the right against the spring. Upon resumption of operation the control-air pressure falls to zero and the spring pushes the counter in contact with the pin on the end of the crankshaft, recording the revolutions.

Knowing the compressor capacity, its volumetric efficiency and the total number of cycles, we can calculate the amount of air compressed over any period of time.

N FORMBY *Montreal, Quebec*

EMERGENCY PUMP REPAIR USES CONCRETE



WE HAD an 8-in. vertical pump with a very thin cast-iron volute that developed a leak. Six months were required for the delivery of a part to replace the one that was damaged.

In the meantime, we patched the volute with iron cement in order to keep the pump in service, but another leak developed very close to the repair.

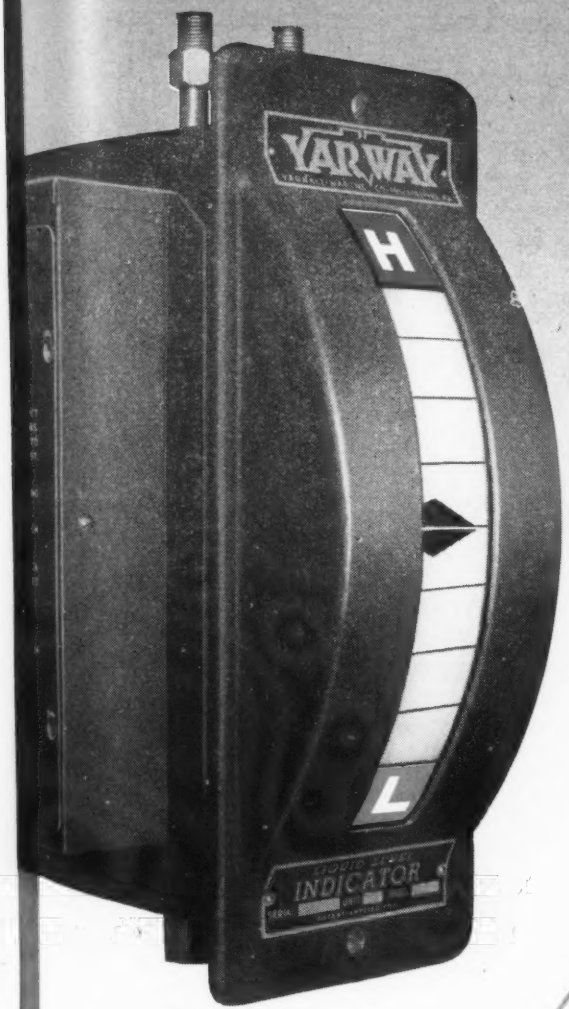
As a last resort we decided to put some plywood forms around the volute, and then poured a ring of reinforced concrete which extended clear around the trouble spot.

The pump is now working perfectly, and we think it will hold up until the new unit arrives. We did not attempt to weld the leak because the thin wall would prove difficult.

E A ROBERTS *Carlsbad, New Mexico*

A COMPLETE SYSTEM...

FOR INSTANT, ACCURATE CHECK ON LIQUID OR BOILER WATER LEVELS THROUGHOUT THE PLANT



Yarway Remote Liquid Level Indicator with Control Unit attached.

Now you can have constant check-up on water levels wherever—and whenever—you want.

The Yarway Liquid Level Indicator, equipped with Yarway Control Unit and auxiliary electric signalling devices, provides this check at two or more locations anywhere in the plant.

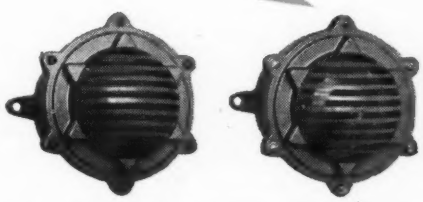
The Yarway Indicator is always accurate because it is operated by the liquid itself. Indicating mechanism is never under pressure. There are no stuffing boxes. Complete separation of indicating and actuating parts is achieved by permanent magnet transmission.

The Automatic Control Unit is attached directly to the Indicator and operates the remote signal alarms (light or horn) at any remote locations.

The Control Unit may also be used as a control for mechanical equipment such as motor-operated valves, pumps, etc.

FOR COMPLETE DESCRIPTION AND SPECIFICATIONS OF YARWAY REMOTE LIQUID LEVEL INDICATORS, WRITE FOR BULLETIN WG-1822.

YARNALL-WARING COMPANY
100 Mermaid Ave., Philadelphia 18, Pa.



Yarway Remote Hi-Lo-Alarm Signal Horns.

Three Yarway Remote Hi-Lo-Alarm Signal Lights, showing low level, normal operation and high level. Each unit shows all levels.

YARWAY REMOTE LIQUID LEVEL INDICATOR

PROBLEMS FROM THE PLANT

Exercise your engineering wits by submitting answers to this question, fresh from the plant. Suitable material will be paid for; answers accompanied by sketches or photographs command additional pay

How Can We Ventilate Our Plant Cafeteria?

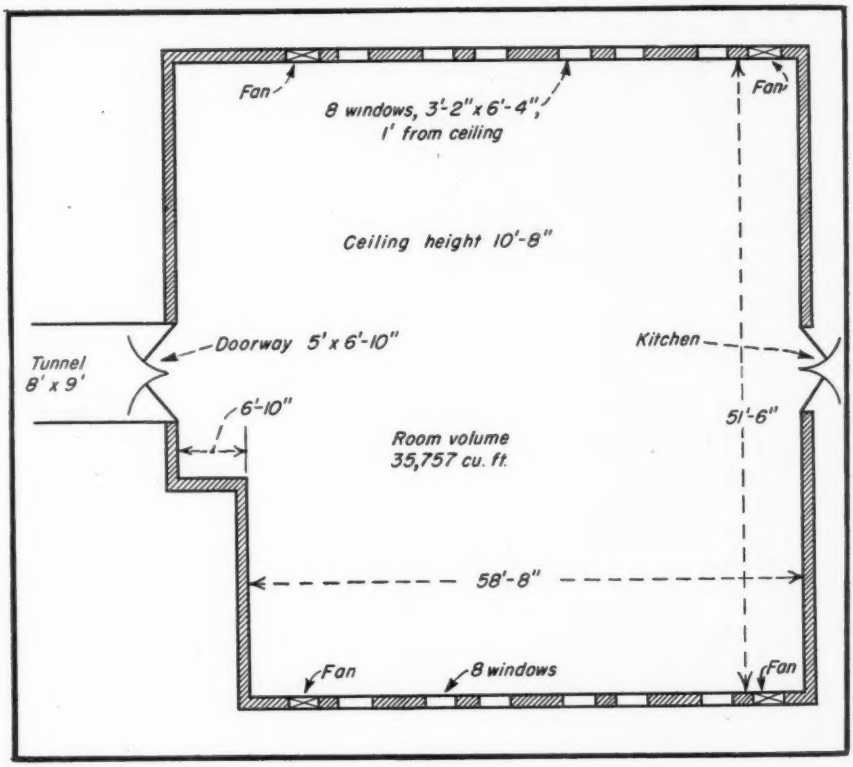
OUR CAFETERIA becomes uncomfortably warm and stuffy when in use during summer months. We plan installing exhaust fans to draw cool air from the basement of our main building through the dining room. Tunnel shown in sketch connects to main-building basement.

Cafeteria seats 225 people during each of the 40-min lunch periods between noon and 2 pm. I think four exhaust fans placed in the end windows, as shown, would provide proper ventilation.

Placing each fan in top sash of corner windows should prevent dead spots at the tunnel end of room. Of course we plan to keep all dining room windows closed when fans are on. We are toying with the idea of how many changes of air constitute good practice.

Perhaps POWER readers have met this or a similar problem in their plants and found a good solution. We would like to know the capacity, placement, size and type fans for best results. We are also puzzled as to what air velocity constitutes a draft.

Since we will change the cafeteria's location in a few years, we plan to spend but little money on this job.—*RD*



Readers' Answers

What Can We Do to End Steam-Pump Slam?

(This question is from July issue with best answers from readers.)

WE ARE HAVING TROUBLE with a reciprocating steam pump in our plant. As shown in accompanying sketch [POWER, July, p 128] the pump handles hot water at a temperature of 204 F.

When the tank is full, pump suction is about 4 ft below surface of liquid. When tank is empty this distance reduces to 6 inches. Suction line to the pump is 5 in. dia, copper tubing about 6 ft long; the discharge dia is 4 in. Pump is double-acting reciprocating steam type, 12x10½x14, operating at 70 strokes per minute. Pump head is 35 lb.

The pump slams and we have great difficulty keeping the valves tight. There is no way of increasing the suction head. Will POWER readers tell us how to make this pump operate quietly?—**GR**

Use Bigger Suction Line

GR's TROUBLE IS CAUSED by too small a suction line. A pump of this size should have at least an 8-in. intake pipe. Some time ago I had similar trouble with a pump and solved it by enlarging the suction line.

Trouble of this nature is caused by cylinders not receiving enough water. On the pump stroke, piston speeds up till it slams into the wall of water.—**George G Avant, Wilmington, N. C.**

Reduce Line Friction

SLAM IN *GR's* pump is caused by water cylinder being partly full when the steam end starts its stroke. Piston picks up speed and slams when it suddenly stops the weight of water.

GR can probably solve his problem by cutting down the friction loss in the suction line, making it larger, shorter and smoother. He should reduce the number of bends and elbows to a minimum.—**N Arthur Helmer Jr, Plainfield, N. J.**

Increase Water Pressure

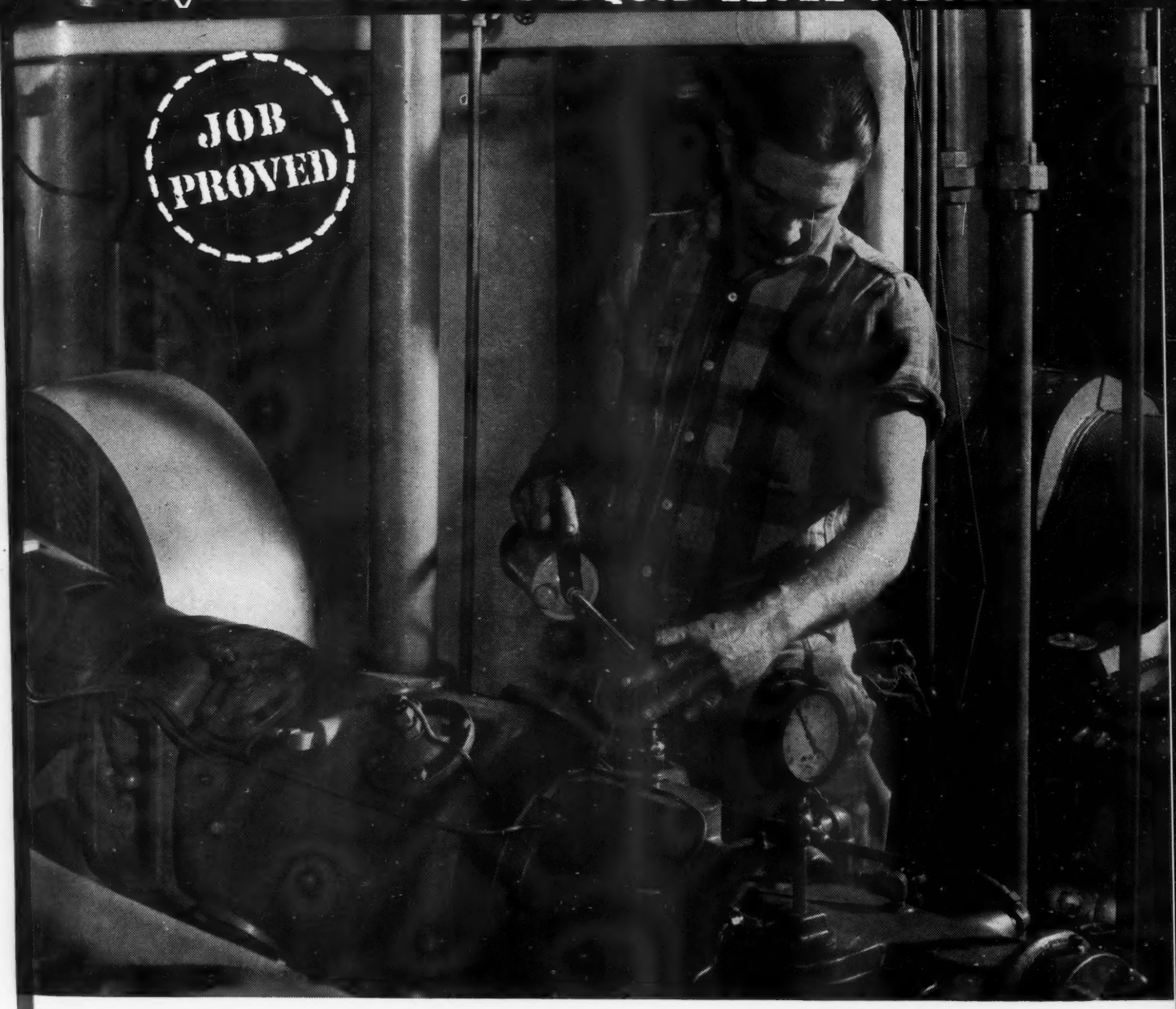
SLAM IN *GR's* pump is caused by water flashing to steam because of low head pressure and high water temperature.

For proper operation pump must have a greater npsh (net positive suction head) than at present. Available npsh may be found by following formula:

Available npsh $= Z + 2.31\ (P - P_v) - H_f - H_e$; where Z = Static head in feet; P = Pressure on water surface, psia; P_v = Vapor pressure at pumping temperature, psia; H_f = Friction loss in feet in suction piping; H_e = Entrance loss between tank and suction line.

Looking over the above equation we

(*Continued on page* 140)



UNDER PRESSURE 11 YEARS...STILL GOING STRONG

A Sun Oil Helps Keep Compressor on the Job 16 Hours a Day—No Hard Carbon Forms

The "lungs" of a forced ventilation system in a large industrial plant are two-stage air compressors—pumping air through the system at 300 pounds per square inch.

One of these compressors, now over 11 years old, has been running 16 hours a day since its installation. From the start, a Sun lubricant has been used to lubricate crosshead and air cylinder. During the past five years there has been but one shutdown . . . and that occurred when a different brand of oil was used by mistake!

Operating on the Sun lubricant, the compressor is running as well today as ever. No hard carbon has formed. As a result of this record the plant has standardized on Sun lubricants for all its air compressors and vacuum pumps.

This performance is typical of the advantages gained from "Job Proved" Sun lubricants in thousands of industrial plants. Further information can be had from any Sun Office. For a copy of the booklet "Lubrication of Air Compressors and Pneumatic Tools" write Department P-10.

SUN OIL COMPANY • *Philadelphia 3, Pa.*
In Canada: Sun Oil Company, Ltd.
Toronto and Montreal

SUN PETROLEUM PRODUCTS
"JOB PROVED" IN EVERY INDUSTRY

SUNOCO

find the only term we can conveniently vary in *GR's* case is P, pressure on water surface. Keep in mind that reciprocating pumps require npsh of about 6 ft, depending on operating conditions and pump design.

By closing tank top and applying steam or air pressure of 15 lb on the water surface the 2.31 $(P-P_v)$ term in above equation becomes 39.7 ft. Further improvement can be had by decreasing the H_f and H_e terms. This is done by increasing size of suction line and smoothing entrance connection.—**J D Constance, Cliffside Park, N. J.**

Larger Pipe Size

BEST SOLUTION TO *GR's* problem would be to raise tank or lower pump. Since this is impracticable, I suggest he install a short suction line of larger diameter, with minimum number of bends.

If he cannot do this readily, next bet is to reduce pump speed.—**George Griffel, New York, N. Y.**

Check Valve Springs

I ADVISE *GR* to find out if his suction-valve springs are too strong. When these springs are under heavy tension, the amount of water entering pump cylinder is considerably lessened, resulting in an increased air pocket.—**George Holman, Decatur, Ill.**

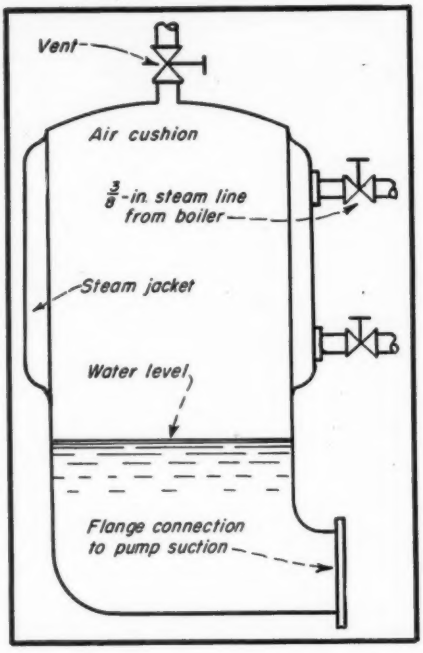
Reduce Water Temperature

GR's PROBLEM is clearly one of vaporization, occurring in the suction line or pump cylinders, due to low pressure at the pump input. I suggest he lower the temperature of the water being handled. If its temperature must be kept constant, then the suction head must be increased.

Water temperature may be reduced in a number of ways: (1) a cooling jacket built around suction line; (2) heat exchanger in the same line; (3) cold water injected at pump inlet.—**Cloyd J Ray, Junction City, Kan.**

Inspect Valve Disks

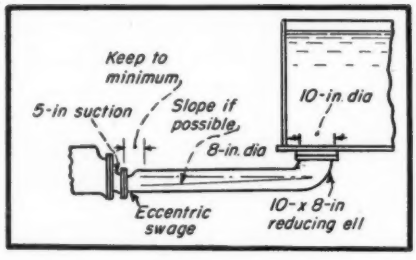
I SUGGEST *GR* check his pump before making extensive changes in piping, tank or pump. We operate a 20x11½x 10-in. service-water pump under similar conditions. Some time back, it developed a bad slam. On removing the cover we found a suction valve had backed out, parts being scattered on valve deck. *GR* should check further, to see if his valve disks are of hard material, designed for hot-water use.—**Arthur Belton, Montreal, Canada.**



Use Cushion Chamber

I SUGGEST *GR* install a suction cushion chamber to end pump slam, as in above sketch. Make chamber so it holds three or four times the pump's cylinder capacity. Connect chamber at pump so input water flows directly to it.

Any vaporization that occurs will seek an outlet into the chamber rather than be trapped in pump cylinder.—**D J Parmer, Quincy, Fla.**



Lower Pump Speed

WITH THE PISTON lowering pressure on suction stroke, some hot water flashes to steam. As a result the piston jumps part of stroke, which causes slamming. By slowing down to a point where pump operates quietly (about 40 to 55 strokes per min) efficient operation results. Pump then discharges full cylinders of water rather than a combination of steam and water as at the higher speed. This saves steam, wear and tear on the machine, to say nothing of injury to the nerves.

If *GR* can't quiet down his pump by reducing speed, I suggest he increase size of suction line, as in above sketch. The swage causes the 5-in. nozzle to become an orifice while an increase in line size to 8 in. cuts velocity to about half.—**Joseph P Kilcer, Oceanside, N.Y.**

Float Valve Keeps Head

GR's PUMP SLAMS because a suction head of at least 3 ft is needed to prevent steam binding of the cylinder when handling water at 204 F. Since it is impossible to increase suction head on the pump, he should install a float valve.

In addition to maintaining a fairly constant level in tank, *GR* should increase size of pump suction line and reduce pump speed.

Both high water temperature and excessive water velocity probably cause valve wear. Flow through valves should not exceed about 100 fpm.—**Tyler G Hicks, New York, N. Y.**

Cut Suction-Line Losses

IF *GR* CHANGES his pump-suction line to one having an 8-in. dia, with a long sloping reducer at the pump and a 10-in. opening into the tank, he will materially reduce pump slam because of lower suction-line losses.

Springs on suction valves should exert as little pressure on valves as possible since any excess pressure hinders the entrance of water. As an added thought, he would find a centrifugal pump more satisfactory than his present reciprocating type.—**Ira A Butcher, Piney River, Va.**

Install Float Controls

A FLOAT VALVE hooked up to keep tank water high will end *GR's* pump slam. If flow to tank is intermittent, connect a float to the incoming steam line so the pump will slow down as water level drops. Steam supply should cut off when water reaches low level.

If not practicable to install any of the above controls, steam pressure to the pump should be regulated by hand or through a reducing valve, keeping steam pressure to a minimum.—**E O'Brien, Springfield Gardens, N. Y.**

Add Cold-Water Line

ASSUMING *GR's* pump slams when there is a full tank of water, I believe his trouble arises from attempting to pump water out faster than it can flow in through the 6-in. suction line. As a result, a partial vacuum forms, tending to flash the hot water to vapor.

There are three solutions: (1) Increase size of suction line. (2) Reduce

(Continued on page 176)

Let's Talk About *Your* Boiler Plant

In particular, let's talk about water conditioning in your boiler plant.

First, we should recognize that complete and efficient water conditioning starts with the raw water and continues through the plant, taking in many problems. "Trouble-spots" may occur at many points throughout the system—from the raw water intake to the boiler blowdown discharge.

Secondly, *correct* water conditioning is a matter of careful and scientific control. For proper results you should be sure to choose a water conditioning service offering the very best in up to date engineering practice.

W. H. & L. D. BETZ is an organization of engineers and chemists specializing in the solution of all industrial water problems. Years of experience have made Betz water conditioning service scientifically correct . . . complete . . . economical.

Our nationwide staff of engineers will welcome the opportunity of discussing with you this important subject of water conditioning . . .
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REVIEWED THIS MONTH:

DIESELS

Centrifugal Blowers for Two-Cycle Engines

HYDRO POWER

Flood Control and Power in Southwest
Sediment Transportation in Streams in Relation to Power-Plant Operation

STEAM POWER

Steam Power Plant Appraisal
Package Steam Units

OPERATOR TRAINING

Training Operating Engineers
Training Power-Plant Personnel
A Training Program for Custodians and Boiler Operators

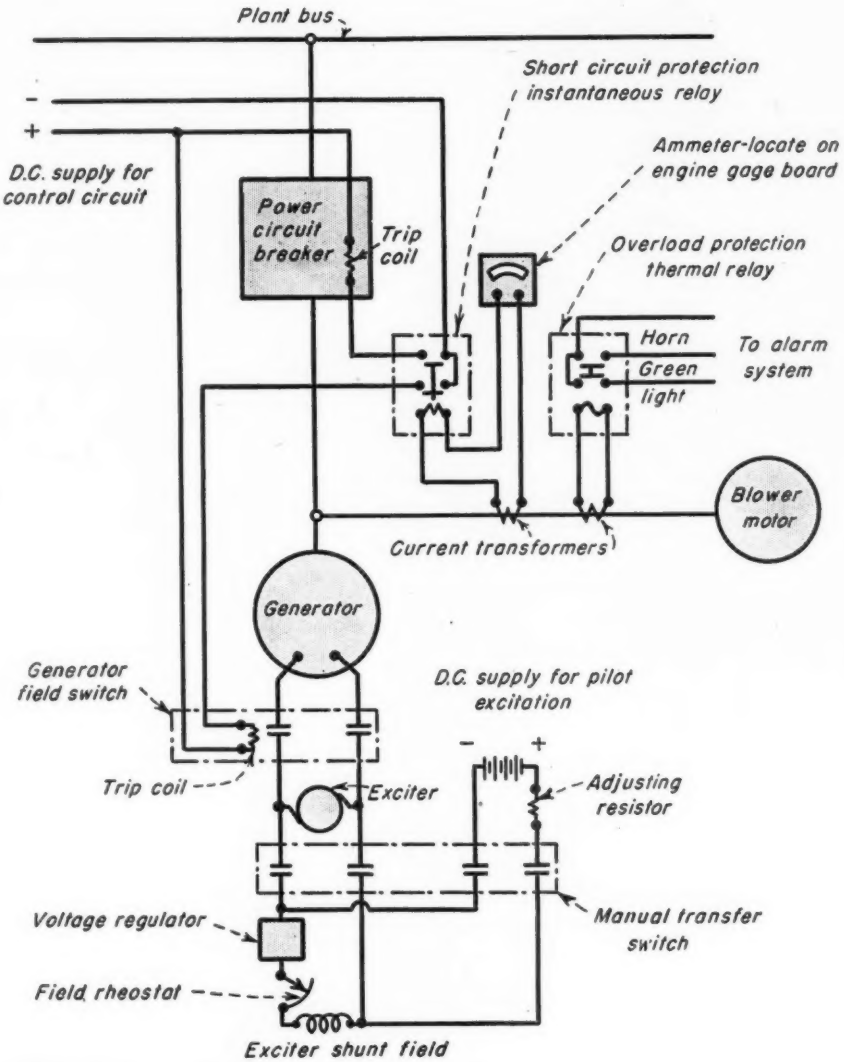
For Complete Text:

Material in these briefs comes from one of three sources:

Midwest Power Conference, Tenth annual meeting, Chicago. April 7-9, 1948. Papers identified by initials *MPC*. Available in Volume X, Proceedings of Midwest Power Conference, 1948, $3, through Stanton E Winston, Conference Director, Illinois Institute of Technology, 3300 Federal St, Chicago 16.

American Society of Mechanical Engineers, Oil and Gas Power Div meeting, St. Louis, May 22-24, 1948. Papers are identified by initials *ASME* and paper No. Available while supply lasts at ASME, 29 W 39th St, New York.

Oil Heat Institute of America, Inc, New York, N. Y. Annual meeting, Chicago. April 5-8, 1948. Papers are identified by initials *OHI*. Only copies are ones made available to those in attendance at the annual meeting.



CENTRIFUGAL SCAVENGING BLOWER is electrically connected to its generator for starting with the engine. Pilot excitation, usually from battery, speeds starting

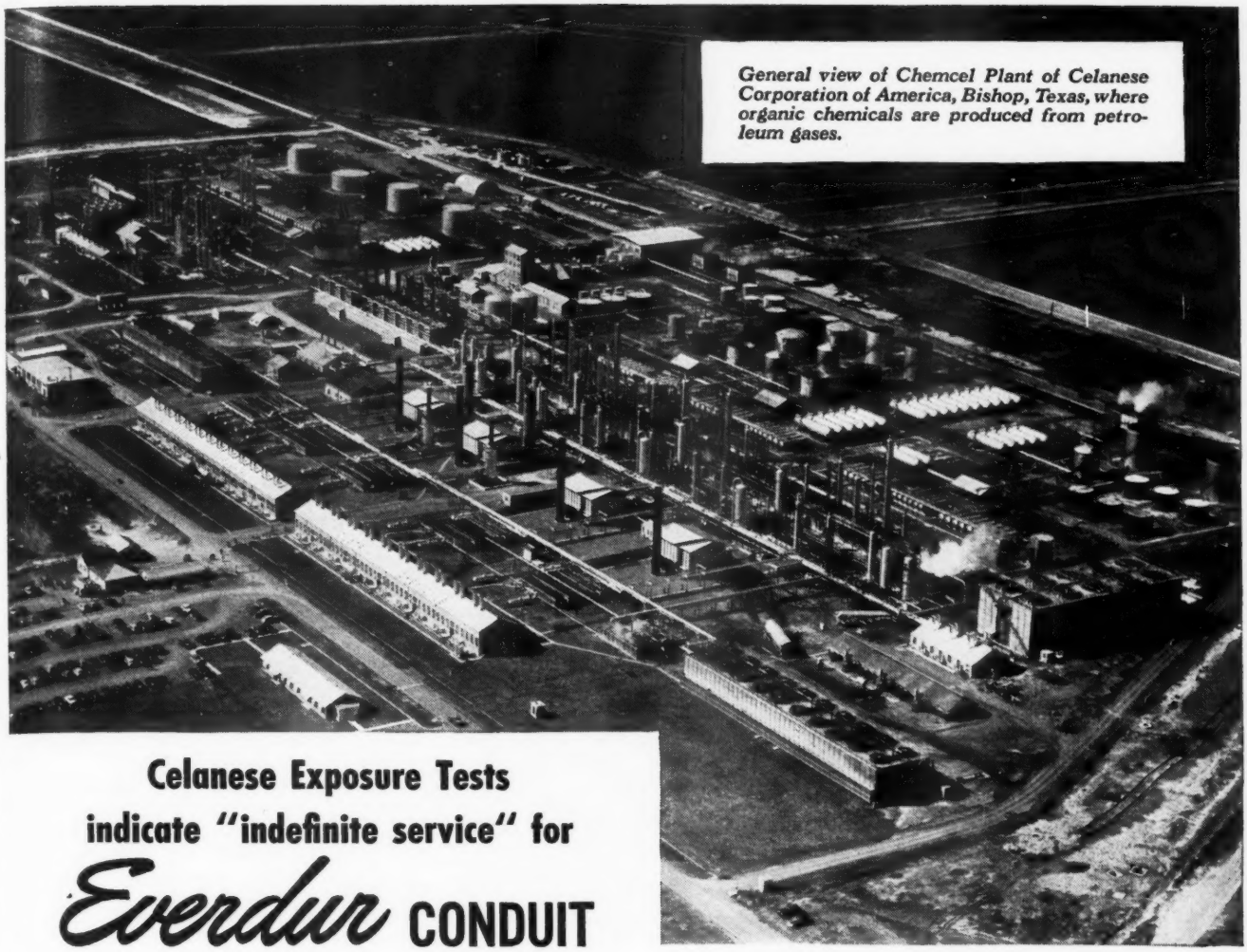
DIESEL ENGINES

Centrifugal Blowers for Two-Cycle Diesel Engines *by Robert Cramer Jr, Nordberg Mfg. Co.* Discussing various means currently employed for scavenging 2-cycle diesels, the author tabulates blower, drive and combined efficiency of each, showing the Roots positive-displacement blower, gear-driven from the engine crankshaft, to be most efficient. In spite of this, other considerations, such as space restrictions and better air distribution in very large engines, may favor the centrifugal blower, and it is the only answer for extremely large units.

To give a clear picture of the relation between blower characteristics and engine air requirements, the author analyzes the situation fully, giving air-requirement data based on experimental investigations of 2-cycle engines of 17.5, 21.5 and 29 in. bore, with 5 to 10 cylinders. He points out that characteristic curves must be constructed for the blower unit as installed, allowing for increasing resistance in the intake system with increasing volume, decreasing motor speed with increasing horsepower and fouling of engine and blower vanes.

Centrifugal blower must be selected for the most unfavorable condition—90 F, minimum barometer, maximum load, plus allowance for fouling. This makes it necessary to limit blower power at high-density and minimum-

(*Continued on page* 164)



General view of Chemcel Plant of Celanese Corporation of America, Bishop, Texas, where organic chemicals are produced from petroleum gases.

Celanese Exposure Tests indicate "indefinite service" for *Everdur* CONDUIT

ELEVEN test specimens of Everdur* Rigid Electrical Conduit, ¾" nominal size, mounted on top of cooling towers of the Chemcel Plant at Bishop, Texas, graduated with honors from a 95-day course in compound exposure.

These 2" long test sections were exposed to sunlight, continuous water vapor spray, plant fumes, plant Northeast and Southwest winds and a temperature range of 32° F. to 87° F.

Examination showed no pitting of samples and an average corrosion rate of .000395 i.p.y. "During the test," states the Metallurgical Laboratory report, "the surface of the specimens became coated with a thin, black corrosion product film which would be in no way detrimental in the service intended."

"Everdur Conduit would," the report continues, "at the rates determined, last indefinitely in service as electrical conduit in the locations tested."

Everdur Copper-Silicon Alloy Conduit possesses high strength, is non-magnetic, workable and weldable. It is available in two wall thicknesses: rigid conduit (RC) in nominal sizes from ¼" to 4" inclusive; and the thinner walled electrical metallic tubing (EMT) in nominal sizes ⅜" to 2" inclusive. Complete lines of fittings . . . connectors, couplings, outlet boxes, etc. . . . are available in Everdur Alloys from leading manufacturers. 49224

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ENGINEER'S BOOKSHELF

REVIEWED IN THIS ISSUE

FRACTIONAL HORSEPOWER ELECTRIC MOTORS

THE FRACTURE OF METALS

HEATING AND VENTILATING BUYERS' DIRECTORY

IMPROVING SUPERVISION

ASTM SPECIFICATIONS FOR STEEL-PIPING MATERIALS

MATERIAL HANDLING

INDUSTRIAL ELECTRONICS REFERENCE BOOK

BATTLEFRONTS OF INDUSTRY

Fractional-Hp Motors

FRACTIONAL HORSEPOWER ELECTRIC MOTORS (*second edition*—1948). *By Cyril G Veinott, manager, induction-motor section, small-motor division, Westinghouse Electric Co* 554 *pp.* 6½x9½; *illust.* $5. *McGraw-Hill* Book Co, 330 *West 42nd St, New York* 18, *N. Y.*

This story of fractional-hp motors shows what types and kinds are available and what makes them run. The book is written primarily for those interested in installation, maintenance and repair of the fractional-hp motor.

Eight chapters have been rewritten. All original material for motor repairmen is rearranged in more convenient form. The chapter on motor selection will help application engineers choose the right motor for the job.

New material discusses windings with dissimilar coils, insulating varnishes, including dipping and baking procedures and a description of an electronic winding-insulation tester. There is a complete description of the all-purpose capacitor motor used in unit-heater service.

Heating and Ventilating

HEATING AND VENTILATING BUYERS' DIRECTORY: 320 *pp*, 5⅜x8¼ *paper.* $1. *The Industrial Press,* 148 *Lafayette St, New York* 13, *N. Y.*

A product directory that lists (1) manufacturers by name (2) supply sources for equipment, services. A trade-name section includes current and obsolete trade names, together with the product it is associated with, and the manufacturer's name. A closing section carries a separate listing of manufacturers' street addresses.

Metal Fracture

THE FRACTURE OF METALS. *By M Gensomer, E Saibel, J T Ransom, R E Lowrie.* 58 *pp* 6x9, *paper.* $1. *American Society of Welding Engineers,* 33 *W 39th St, New York* 18, *N. Y.*

Reviews, literature and interviews with experts are summarized for up-to-date information on fracture problems.

Originally in report form to Bureau of Ships, U. S. Navy, booklet divides into two parts: Part I includes original literature survey, and an analysis of fracture theories and application of principles. Part II is a supplement that builds upon Part I with new developments in theories of fracture and plastic flow. A research program is outlined; over 300 references form a bibliography.

Supervision Training

IMPROVING SUPERVISION. *By Frank and Robt W Cushman,* 232 *pp,* 5x7¼, *cloth.* $2.50. *John Wiley & Sons, Inc,* 440-4*th Ave, New York* 16, *N. Y.*

Here's a follow-up in a foreman- or supervisor-training program. Its value to the power engineer applies most to (1) shift or watch engineers (2) maintenance foremen who have direct relations with younger men breaking into the power game.

This book stresses the human side of developing and bringing along operating workers to accept and understand the management side of the supervisor's responsibilities. Once some acceptance is developed, next step is to get active participation among supervisors on a foreman-meeting system to prevent or correct problems that creep up in plant management.

Material Handling

MATERIAL HANDLING. *By engineers of General Electric Co* (1948 *new*). 93 *pp,* 8½x11, *heavily illustrated, stiff paper.* $1. *General Electric Co, Schenectady, N. Y.*

Here are modern methods of handling materials—one of industry's No. 1 problems—in the three major operations of receiving, shipping and warehousing. Also included are a comprehensive survey of material-handling equipment, methods and practices, and a convenient compilation of engineering data of interest to manufacturers, engineers, warehouse men, electrical contractors and power-sales engineers.

The eight sections cover: modern material handling; material-handling equipment and applications; results with modern equipment; how to make a material-handling survey; engineering data on conveyors, cranes and hoists, trucks and tractors, battery charging and fundamental formulas; list of material-handling-equipment manufacturers; General Electric offices; bibliography of material-handling literature. Illustrations offer a wealth of information on how to apply material-handling equipment efficiency.

Piping Specifications

ASTM SPECIFICATIONS FOR STEEL PIPING MATERIALS, 315 *pp, heavy paper,* $3. *American Society for Testing Materials,* 1916 *Race St, Philadelphia* 3, *Pa.*

This book gives in the latest form as of Dec 1947 all specifications covering steel-piping materials—pipe, tubes, castings, bolting, etc.

There are widely used specifications covering pipe for service at normal and elevated temperatures; several carry '47 designations. In the field of tubing for boilers and superheaters 13 specifications cover seamless, welded and other types of tubes involving a wide range of chemical composition and properties. There are three specifications each for still tubes and for heat-exchanger and condenser tubes. Five relate to castings for general application and high-temperature service. Three standards pertain to forgings or rolled-pipe flanges and one covers welded fittings; three relate to bolting. The book is made complete by including the classification of grain size in steel, E-19, with its two charts.

Industrial Electronics

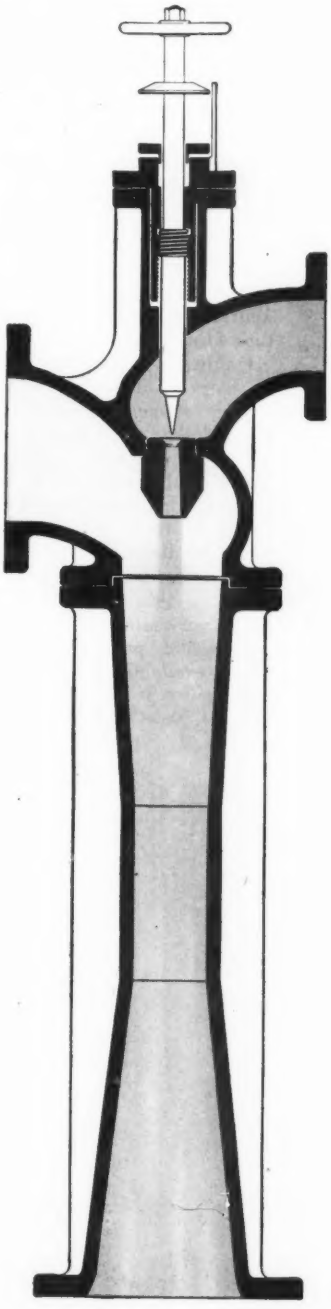
INDUSTRIAL ELECTRONICS REFERENCE BOOK. *By Electronic Engineers of the Westinghouse Electric Corp* (1948 *new*). 680 *pp,* 9x12, *heavily illust. cloth,* $7.50. *John Wiley & Sons,* 440-4*th Ave, New York* 16, *N. Y.*

To insure that electronics as an industrial tool is used properly, 37 electronic engineers have written a digest of application and design data on industrial electronic equipment. It is aimed at practicing engineers faced with understanding the principles as well as the scope and limiting factors of electronic apparatus as applied to industrial processes.

Here's what the chapters cover: 1-3, fundamental and theoretical concepts of basic laws governing production and control of electrons; 4-10, design, operation and construction features of electronic tubes, such as vacuum, gas-filled, X-ray and cathode-ray, photoelectric devices and ultraviolet radiators; 11-14, electronic-circuit components, such as different resistance forms, capacitance and inductance, tuned circuits, filters and transformers; 15-18, rectifier, amplifier, oscillator and control circuits; 19-20, design and application factors for transmission lines and antennas; 21-34, different types of industrial equipment; 35-36, factors in care

(*Continued on page* 164)

an ƒk "reason why"



as simple as

With an ƒk Jet Compressor . . .

Circulation of steam for better heating . . .
Boosting of low pressure steam . . .
And mixing of gases in desired proportion . . .
Become as simple as ABC.

The ƒk Jet Compressor . . .

Utilizes a jet of high pressure gas . . .
To entrain a low pressure gas . . .
Mix the two . . .
And discharge them . . .
At an intermediate pressure.

The ƒk Jet Compressor is of simple construction . . .

With no rapidly revolving parts . . .
To get out of order . . .
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It reduces wear to a minimum . . .
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Operates economically . . .
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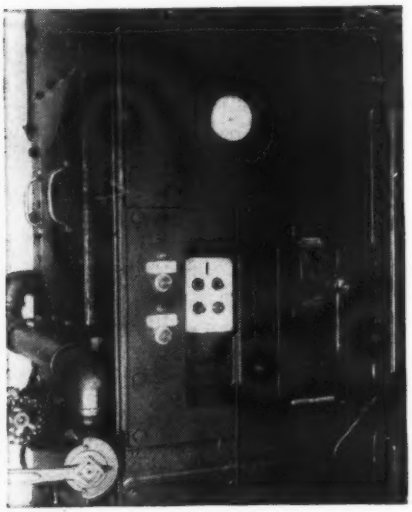
JET APPARATUS • CONDENSERS AND VACUUM PUMPS • HEAT TRANSFER EQUIPMENT
VALVES • ROTAMETERS AND FLOW INDICATORS • GEAR PUMPS • STRAINERS
OIL BURNING EQUIPMENT • SPRAY NOZZLES AND ATOMIZERS • RADIAFIN TUBES

NEW PLANT EQUIPMENT



Dual-Fuel-Engine Control E331

OPERATION OF DUAL-FUEL ENGINES has been simplified by development of automatic electric controlled accessories operated by two pushbuttons. With this system, indicator lights above buttons indicate which fuel is being burned. All mechanical operations required to change from one fuel to the other are made automatically when the proper button is pushed.

Superior dual-fuel engines are started and stopped in the conventional manner by means of a "stop-run" lever and a separate "air-starting pull handle." After engine starts, governor and special controls regulate engine automatically. Mounted on the governor housing, the pushbutton-control panel is used only when engine is running.

Button marked "oil" has an amber indicator light, while "gas" button has a white one. Pushbutton controls are connected with an automatic alarm and safety system and, through electric relays, operate a solenoid valve in the gas line. The amber light is on when engine starts and stays on after pushing the "gas" button until governor regulates gas flow and reduces oil flow to pilot volume.

Before converting to dual-fuel operation, a hand-operated shutoff valve in the gas line must be opened. When "gas" button is pressed, white light glows and control shaft admits gas into each cylinder through feather valves that are held closed by light springs and opened by suction created by flow of air into cylinders. At the same time, governor moves back to hold fuel-pump racks in pilot-oil position and to regulate position of gas butterfly valve as required by engine load.

If gas supply is inadequate for engine load, governor automatically increases oil injection and amber light glows again. If load then decreases or if gas supply increases beyond load needs, oil injection is reduced automatically to pilot volume and amber light goes out.

If it is desired to operate engine on less than full-load gas requirements, hand-operated valve in gas line may be set on its graduated dial to restrict gas flow to desired amount. Governor then automatically increases oil injection as needed.

To change back from dual-fuel to oil operation, the "oil" button is pressed. The engine may be stopped simply by moving standard control lever to "stop" position. **Superior Engine Div, National Supply Co, Springfield, Ohio.**

Welding Rod E332

SMALLER DIAMETER ROD for steel torch welding is designed to low-heat weld all steels. *Eutecrod* 16, $\frac{3}{32}$ in. dia, may be used in ring form, preplaced and heated, either by torch or induction heating. **Eutectic Welding Alloys Corp, 40 Worth St, New York 13, N. Y.**

Air Vent E333

HIGH-PRESSURE AIR VENT uses large diameter phosphor-bronze helical bellows to permit, states the manufacturer, oversize valve orifices at pressures from 0 to 200 psi.

Available in vertical and angle patterns, $\frac{3}{8}$ to $1\frac{1}{4}$ in. dia, these vents have renewable stainless-steel heads, bodies and bonnets of cast brass, cast iron or semi-steel, depending upon size and pressure. **Sarco Co, Empire State Bldg, New York 1, N. Y.**

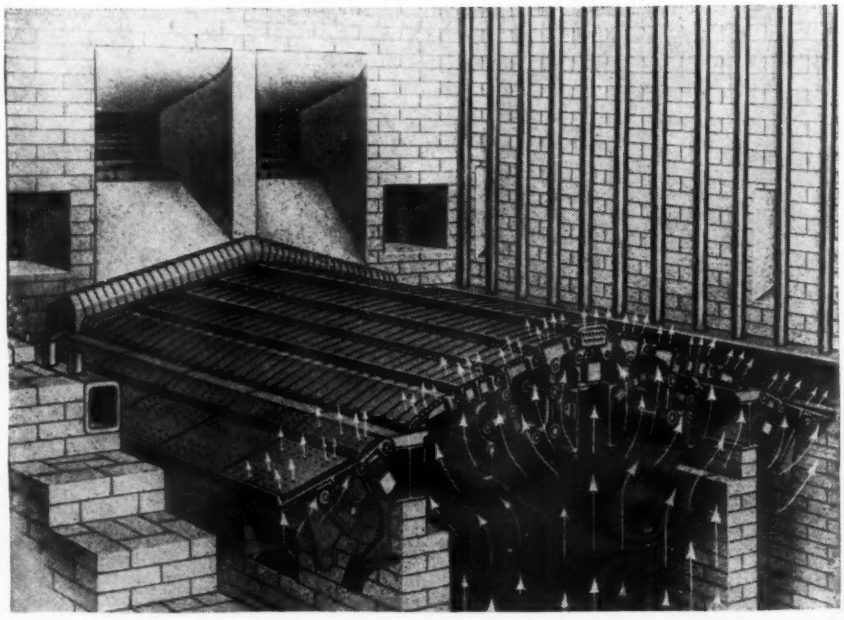
Electrical Insulation E334

KNOWN AS QUINTERRA, this new installation has an asbestos base and is completely inorganic. In appearance it resembles paper and is furnished in long lengths in roll or tape form.

Quinterra is a closed structure, having no holes or interstices as compared with woven or open structure of painted and glass cloth.

This insulation is non-flammable, and remains unaffected by heat even when exposed to high temperatures for a prolonged period of time. At room temperature its minimum dielectric strength is about 250 v per mil. In contrast to other electrical insulations, this value increases with continued exposure to high temperatures, becoming 400 v per mil at 300 C.

It is available in tape form from $\frac{1}{4}$-in. to 36-in. rolls. **Johns-Manville Corp, 22 E 40th St, New York 16, N. Y.**



Spreader Stoker E335

COMPLETE ECONOMICAL COMBUSTION of any grade of coal, even lignite, is possible, maker claims, with new *Centrafire* spreader stoker. Coal is trajected by an air-cooled hydraulic-motor-driven rotor so it falls evenly over entire length of a link grate, similar in principle to that used on Westinghouse underfeed stokers. Undulation of central grate keeps fuel bed active and moving toward ash-discharge grates at the

Use convenient reply cards on page 206a to secure additional information on these new equipment items. Please be sure to identify your request with the new-equipment key letter, *E*, and number, as shown on the items above.

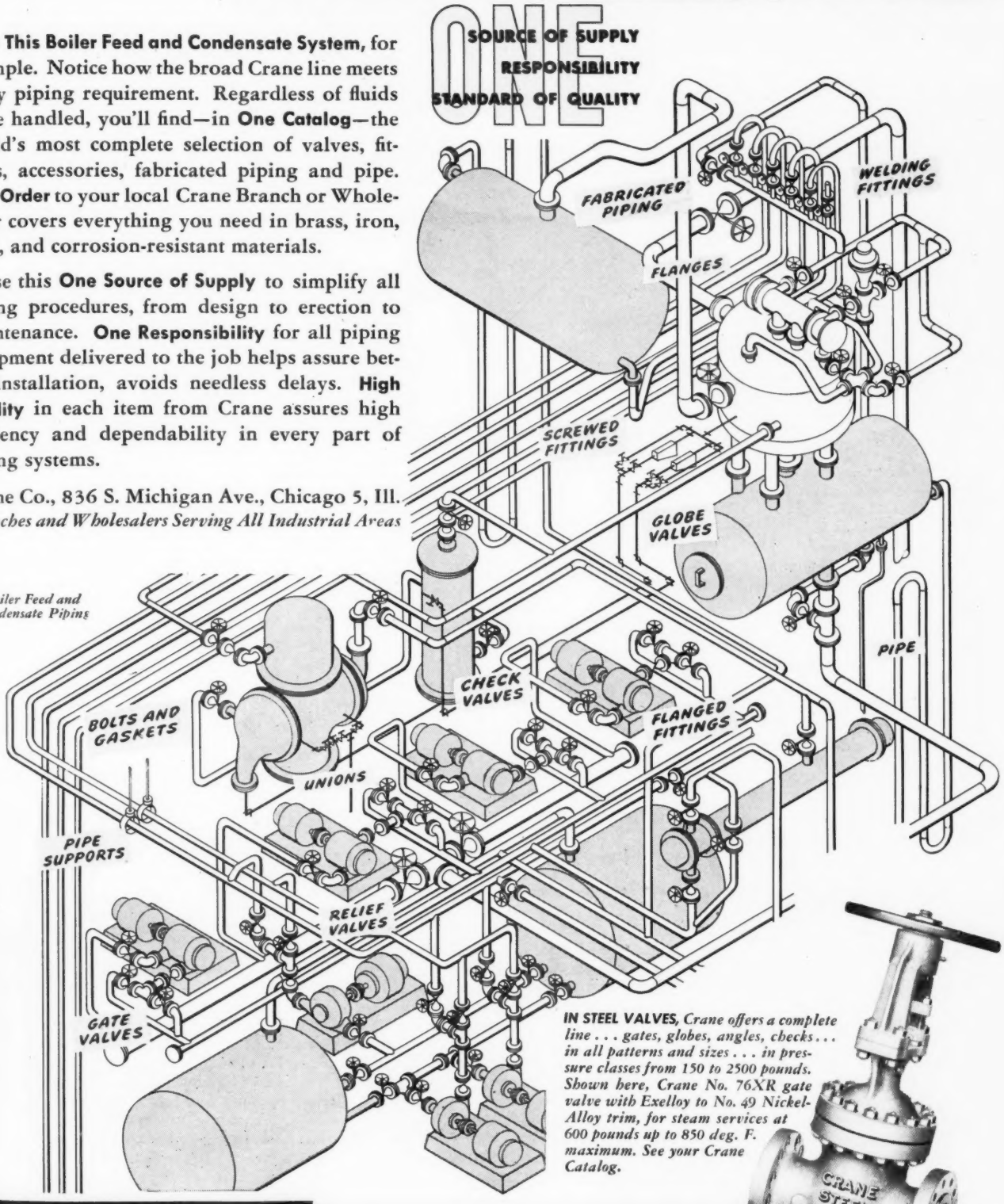
If it's anything in piping...

CRANE has everything you need

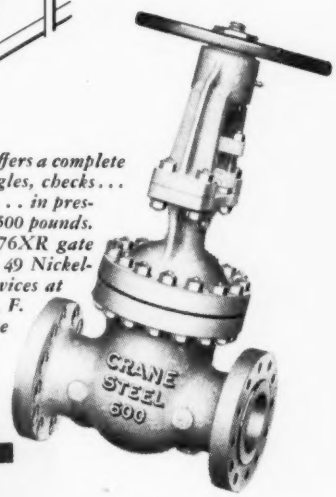
Take This Boiler Feed and Condensate System, for example. Notice how the broad Crane line meets every piping requirement. Regardless of fluids to be handled, you'll find—in **One Catalog**—the world's most complete selection of valves, fittings, accessories, fabricated piping and pipe. **One Order** to your local Crane Branch or Wholesaler covers everything you need in brass, iron, steel, and corrosion-resistant materials.

Use this **One Source of Supply** to simplify all piping procedures, from design to erection to maintenance. **One Responsibility** for all piping equipment delivered to the job helps assure better installation, avoids needless delays. **High Quality** in each item from Crane assures high efficiency and dependability in every part of piping systems.

Crane Co., 836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving All Industrial Areas



Boiler Feed and Condensate Piping



IN STEEL VALVES, *Crane offers a complete line . . . gates, globes, angles, checks . . . in all patterns and sizes . . . in pressure classes from 150 to 2500 pounds. Shown here, Crane No. 76XR gate valve with Exelloy to No. 49 Nickel-Alloy trim, for steam services at 600 pounds up to 850 deg. F. maximum. See your Crane Catalog.*

EVERYTHING FROM . . .

VALVES • FITTINGS
PIPE • PLUMBING
AND HEATING

CRANE

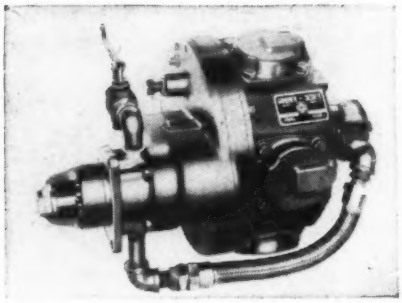
FOR EVERY PIPING SYSTEM

side. There is no interruption of coal feed, loss of pressure or reduction in steam load associated with ash discharge, which is continuous.

The *Centrafire* principle deliberately provides a deficiency of air for combustion of the fuel as it descends to, and rides over, the central link-grate section. This "gas-producer" process causes low-velocity monoxide gases, having low particle-carrying capacity, to rise above the central fire zone. Upon leaving this zone, these gases mix thoroughly with additional air for burning to carbon dioxide. High-pressure air for this purpose enters through staggered nozzles in the sidewalls, above the trajectory of incoming fuel. The turbulence required for thorough mixing is created in the atmosphere above the spreading zone—out of the region where coal is in suspension. An increased supply of metered primary air is admitted through side areas of the grate and the ash-discharge grates.

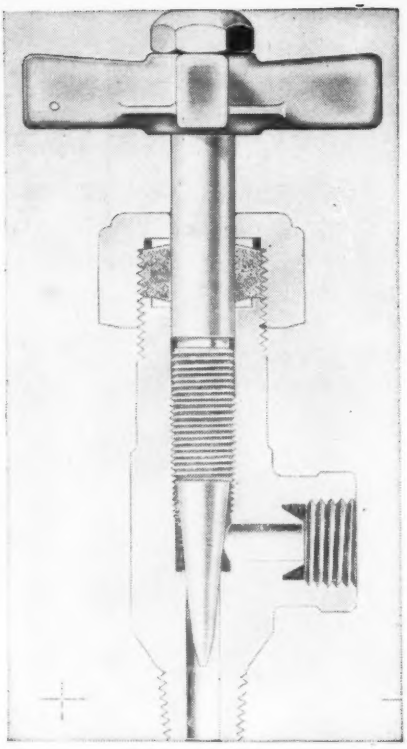
Two long-stroke slow-speed rams feed coal to the rotor. A coal-feed equalizer plate driven from the rotor oscillates across incoming fuel to assure continuous feed whether coal is wet or dry.

One constant-speed motor or turbine supplies oil pressure for all controls and drives. Eliminating all chain or other drives, this completely hydraulic system permits maintaining accurately any preset fuel-air ratio. **Westinghouse Electric Corp, Box 868, Pittsburgh 30, Pa.**



Engine Air Starters E336

NEW LINE of starters for gas, gasoline or diesel engines includes five sizes, developing from 3 to 15 hp on 100-psi air. High torque characteristic of piston-type motor, maker claims, suits it particularly for diesel applications involving high starting loads. Five-cylinder radial design provides uniform torque. An exclusive feature is the air-actuated starter pinion that, when air valve is open, automatically engages ring gear a split-second before starter begins to crank the engine, thus assuring positive and safe engagement. **Gardner-Denver Co, Quincy, Ill.**



Needle Valve E337

MICROMETER NEEDLE VALVE is a modification of the company's compact forged body industrial valve design, but has 5/16-in.-40 stem threading for close adjustment and a long 10-deg included-angle tapered needle for fine metering. Standard valve is of high-strength brass, but aluminum alloy bodies can be supplied. Needle stems are machined to close tolerances in *duronze*. Valve is available in $\frac{1}{8}$ and $\frac{1}{4}$-in. sizes with eight port combinations of male and female, pipe and tube connections. **Parker Appliance Co, 17325 Euclid Ave, Cleveland 12, Ohio.**

Pulley Lagging E338

APPLIED WITHOUT RIVETS, bolts or heat, *Condersite* all-purpose waterproof lagging dries within ten hours at room temperature. In addition, it is weather- and corrosion-resistant, unaffected by sulphuric acid, oxidizing agents, soaps, alcohols, etc. When dry, it is odorless, tasteless, nontoxic, and non-flammable. This pulley lagging provides a frictional surface that increases transmission efficiency and belt life, by eliminating belt slippage. It is suitable for crown, split and flat pulleys, and for use with leather, cord, wire-woven or rubber belts. Lagging is available in units consisting of 70x40-in. treated fabric with sufficient compound for application and in rolls of any width up to 42 in. It may also be supplied cut to size if pulley dimensions are given. **Condersite Engrg Corp, 2015 Chancellor St, Philadelphia 3, Pa.**

Synchronous Motor E339

AVAILABLE IN RATINGS from 10 to 1,000 hp, this line of synchronous motors has a welded-steel, box-type stator construction in addition to steel-fabricated, all-welded rotor spider assembly.

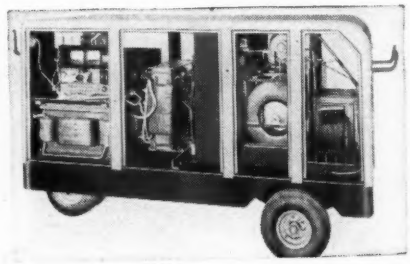
Departing from the standard $2\frac{1}{2}$-to-1 bearings, these motors use sleeve bearings of the pedestal type. Hence bearings are proportioned 1-to-1, the length of the bearing being equal to diameter of the shaft. This new design not only shortens over-all length of the motor, but also effectively decreases bearing temperatures. **Electric Products Corp, 1725 Clarkstone Rd, Cleveland 12, Ohio.**

Refrigeration E340

REFRIGERATING SYSTEM cools air below freezing point of water without forming frost or ice on refrigerant coils, claims its manufacturer. *No-Frost* method consists of (1) spray cooler (2) refrigerant collector and concentrator (3) condenser (4) compressor. **Niagara Blower Co, 405 Lexington Ave, New York 17, N. Y.**

Instrument Cabinet E341

STEEL CABINET of packaged-unit design for air-conditioning instrumentation has dual-range indicator that gives dry-bulb and dewpoint temperature readings. A key switch connects indicator with multiple-resistance bulb circuits for temperature measurement and *Dewcel* circuits for dewpoint measurement. Capacity of the panel is 96 circuits or two circuit connections of 48 each and an automatic off position at center. **Foxboro Co, Foxboro, Mass.**

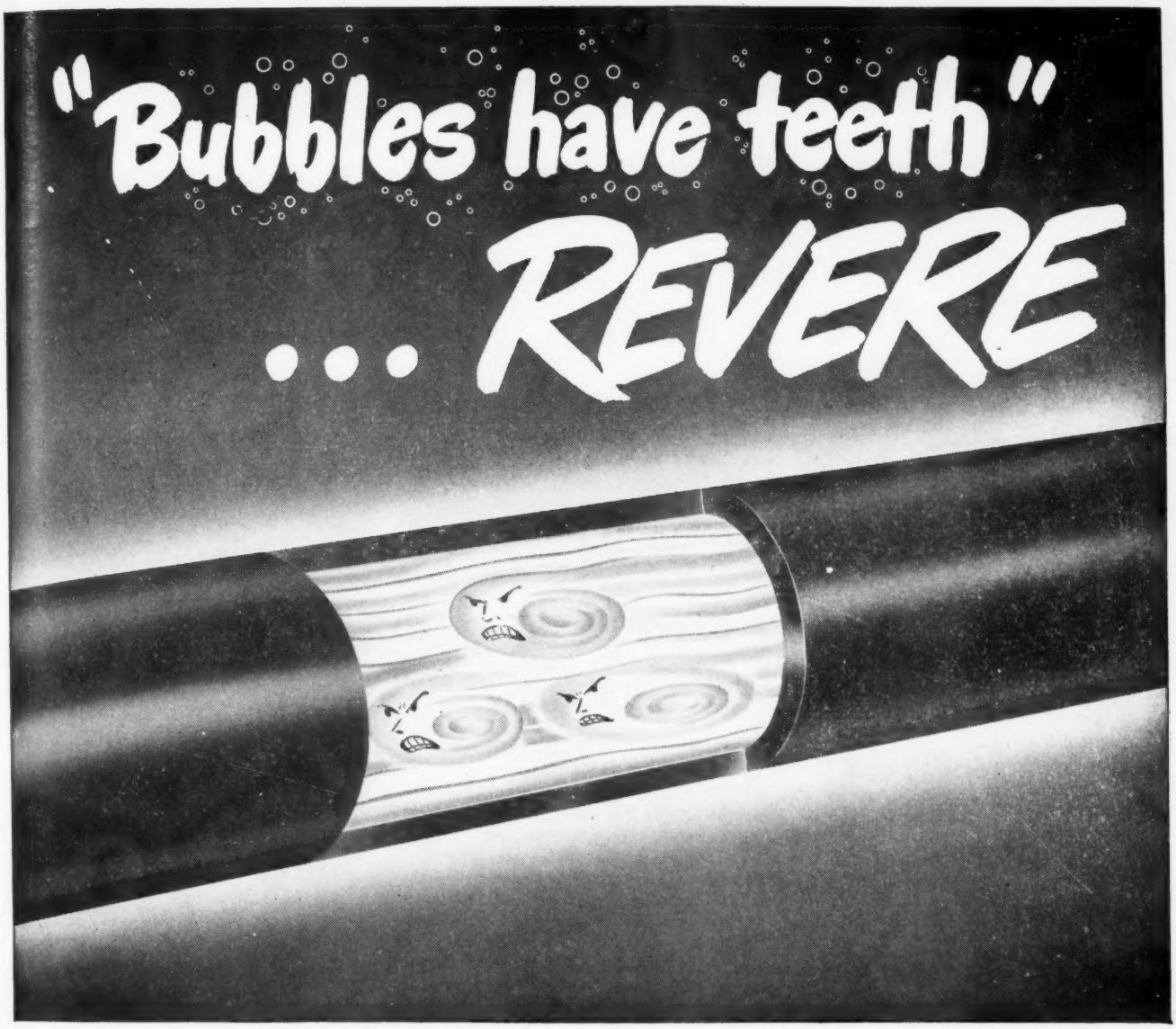


Regulated Rectifier E342

THIS FULLY REGULATED RECTIFIER, with either electronic control for extremely fast response or magnetic amplifier control for vacuum-tube elimination, is designed for use in automatic, unattended battery chargers; large, automatic platers; aircraft ground power; and as a central dc power-system supply.

Standard models offer current ranges from 5 to 10,000 amp and voltages between 10 and 500 v. Voltage regulation is kept to plus or minus one-half of 1% from

Use convenient reply cards on page 206a to secure additional information on these new equipment items. Please be sure to identify your request with the new-equipment key letter, *E*, and number, as shown on the items above.



SOME years ago Revere said that "Bubbles have teeth." It is still true. Air bubbles in a condenser can eat away at the tubes quite rapidly, and become a cause of failure with consequent re-tubing. Air-entrainment, as it is called, acts in several ways, all destructive to tubes. Air contains oxygen, which directly attacks most metals, forming oxides. Carbon dioxide in solution dissolves these oxides. That is not all. Air bubbles add to the erosion effect of turbulent flow. The higher the velocity, the worse the effect, and the more swift and serious is the combination of erosion and corrosion at points of greatest disturbance. Every effort should be made therefore to keep air from being carried into the cooling water. If you are troubled by frequent re-tubing of your condenser, get in touch with Revere, but first save a few samples from failed tubes for examination by our laboratories to determine the cause of failure. Many users of condenser tubes have found our collaboration exceedingly valuable, and we are always glad to cooperate in an effort to extend tube life.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

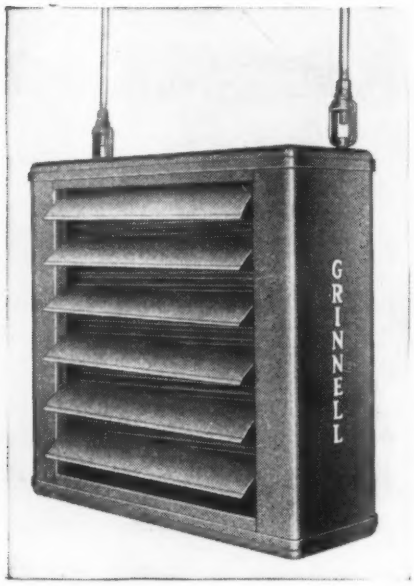
230 Park Avenue, New York 17, New York

Mills: Baltimore, Md.; Chicago, Ill.; Detroit, Mich.; New Bedford, Mass.; Rome, N. Y.—Sales Offices in Principal Cities, Distributors Everywhere.

no load to full load with a 10% change in supply line voltage. Dc ripple may be reduced to 1/100 of 1%. Recovery time under severe load changes is only a fraction of a second. **Industrial Electronic & Transformer Co, 1801 E Slauson Ave, Los Angeles 11, Calif.**

Condensate Returns E343

A COMPLETE LINE of condensate-return units to handle up to 35,000 sq ft of radiation in a heating system and up to 150 psi consists of (1) turbine pump (2) strainer (3) float-switch or makeup valve (4) welded steel receiver tank (5) heavy steel base. **Roy E Roth Co, Rock Island, Ill.**

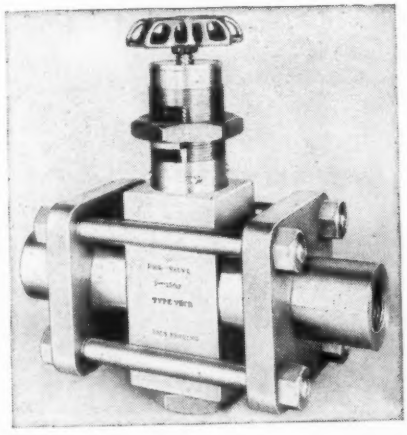


Unit Heaters E344

SMOOTH-CONTOURED heat-transfer surfaces make unit heater suitable for dust and lint-laden atmospheres, claims its manufacturer. *Thermolier* comes in only one size, 113,700 Btu per hr, using steam at 2 psi and entering air at 60 F. Same unit delivers 143,400 Btu per hr under 25-psi steam. Equipment operates under any steam pressure up to 125 psi with corresponding increase in heat-transfer capacity. **Grinnell Co, Providence 1, R. I.**

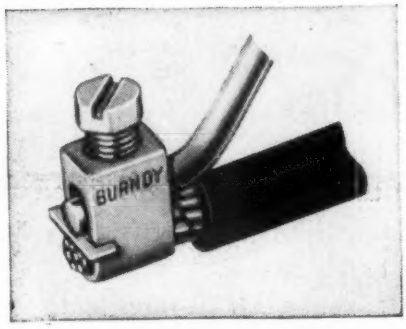
Air Starting Motors E345

AIR MOTOR is keyed or splined to the Bendix or starting mechanism and cranks the engine just as an electric starter turns over an automobile engine. Size 9*BM* has 9 hp and size 20*BM* has 20 hp, at 90 psi air pressure. Motors are small and compact, 13 3/16 and 14½ in. over-all. Air motor is of multi-vane type and throttle valve is quick opening to give peak horsepower almost immediately. Single-step spur gearing is employed to obtain suitable speeds. **Ingersoll-Rand Co, 11 Broadway, New York, N. Y.**



Blowdown Valve E346

IN OPERATION the Paul valve forces a precision ball into low-pressure center of stream, and hence into the seat for shut-off. Valve tends to close automatically whenever water or steam flows through venturi throat. To open valve, stem and yoke push the ball down, rolling it out of seat and down into a recess. Inlet and outlet bushings and seat and ball are of hard *Stellite*. Other parts are high-chromium stainless steel. The 1500-psi series is available in sizes from ¼ to 1 in., conforming with inside dimensions of schedule 80 pipe. Screwed ends are standard; socket or butt welding ends optional. **Paul Valve Corp, 683 Third Ave, New York 17, N. Y.**



Electrical Connector E347

DEVELOPED TO HANDLE copper and aluminum conductors at service entrances, the *Buttin* accommodates every possible combination of service entrance wire; copper to copper, copper to aluminum, aluminum to aluminum, and aluminum to copper.

A pressure bar, also tin-plated, prevents contact of dissimilar metals and distributes the screw pressure so as to minimize cold-flow of aluminum conductors placed beneath it. This connector is similar in both design and appearance to *Buttin* device that the manufacturer provides solely for copper service. **Burndy Engrg Co, 107 Bruckner Blvd, New York 54, N. Y.**

Rotary Hand Pump E348

A 10-GPM CRANK OPERATED BARREL PUMP has 7.5 in. drip pan cast integrally with the bung attachment. Fins in drip pan support oil cans or other containers. Brass screen keeps foreign matter from overflow which runs back into the barrel. Meter measures quantity pumped and has a totalizer reading to 9,999 gal. **Industrial Pump Div, Bowser, Inc, Fort Wayne, Ind.**

Selenium Rectifier E349

INDIVIDUAL SELENIUM ELEMENTS measure 6½x7½ in. and are rated at 12 amp. Leakage current is less than 1 ma/cm² at 25-v rms reversed. Assemblies are suitable for all applications requiring an output in excess of 10 amp. **International Rectifier Corp, 6809 S Victoria Ave, Los Angeles 43, Calif.**

Flow Tube E350

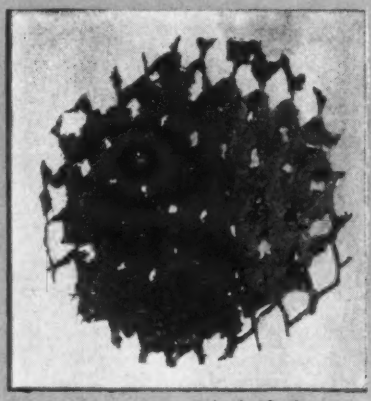
BETH-FLO GENTILE tube consists essentially of a short length of pipe equipped with two groups of pressure nozzles around the inner periphery, one group pointing upstream and other downstream. The nozzle groups are interconnected by common pressure rings from which connections are made to high- and low-pressure sides of a standard flowmeter. Measuring tube can be installed in any section of a pipeline

(*Continued on page* 158)

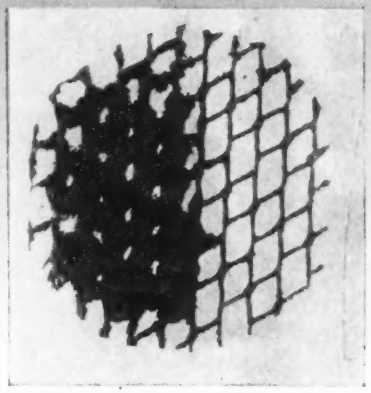
Use convenient reply cards on page 206a to secure additional information on these new equipment items. Please be sure to identify your request with the new-equipment key letter, *E*, and number, as shown on the items above.

announcing... Nalco SR-150

THE SOOT REMOVER THAT REMOVES SOOT!



Grayish soot on right half of test screen above has been treated with Nalco SR-150 at low temperature. See photo below for results.



Same screen as above after temperature rise to 775° F—the treated soot has burned off; untreated coal soot usually burns at about 1135° F.

For the first time, a *scientifically-developed* soot remover that REMOVES SOOT! Nalco SR-150 is the result of years of research, development, and thorough plant tests by Nalco scientists and an independent research organization. Nalco SR 150 removes soot from boiler surfaces by lowering its ignition temperature so that it burns off at normal furnace operating temperatures.

Soot removal with Nalco SR-150 is accomplished with the furnace operating as usual—no need to provide special firing conditions or take boilers off the line. For large furnaces, Nalco has developed an efficient SR-150 feeder—so simple it can be built in most plant maintenance shops. For small furnaces, SR-150 can be fed directly with the fuel, either hand or stoker fired.

Next best news to Nalco SR-150's guaranteed soot removal ability is a price so low that any other method of keeping heat transfer surfaces clean and flues clear is an extravagance by comparison.

Call your Nalco Representative today, or write direct for complete data and prices on Nalco SR-150 . . . the soot remover that REMOVES SOOT!

DEVELOPMENT REPORT AVAILABLE

The story of Nalco SR-150 development, abstracted from progress reports by an independent research organization. Gives the true facts on chemical soot removal . . . its past failures and partial successes . . . and the reasons why SR-150 has earned a place with other Nalco Quality Products. Your copy sent without obligation on request to Nalco.

NATIONAL ALUMINATE CORPORATION

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Canadian inquiries should be addressed to Alchem, Limited, 555 Eastern Avenue, Toronto, Ontario

A Nalco PRODUCT

- - - Serving Industry through Practical Applied Science

How to plan a

HOT WATER CIRCULATION LOOP

Another in the series of basic piping layouts prepared by Jenkins Bros.

To prevent water waste, many local codes make it mandatory to install a Hot Water Circulation Loop in buildings over four stories high. This type installation supplies hot water and maintains it at the proper temperature throughout the system, even though all outlets may be closed for a considerable time. Excessive amounts of water do not have to be run into the drains before the hot comes through.

A hot water tank fed by a roof tank is shown in this layout, but where city pressure is sufficient, the hot water tank can be supplied directly from the city main. In this system, hot water goes up the dead riser to the horizontal main located above the highest hot water outlet. Outlets are supplied from down feeders which are joined at the bottom and tied into the hot water tank inlet. This connection completes the loop and provides for a natural gravity circulation which keeps system water at the predetermined temperatures.

Segregating gate valves are installed at both ends of all risers and drains at the bottom so that a single line can be isolated whenever necessary without disrupting the entire system.

For efficient and economical operation, the hot water tank is maintained at a temperature higher than is required at the outlets. Cold water enters through a thermostatically controlled mixing valve and blends the extremely hot water to the required temperature.

All automatic valves are provided with a three-valve bypass to allow for adjustment or repair, when necessary, without shutting down the line. The globe valve around the bypass can also be used as a temporary regulating valve.

Consultation with accredited piping engineers and contractors is recommended when planning any major piping installation. Copies of Layout No. 39 will be sent on request. Just mail coupon.

Fig. 106-A, a Renewable Disc Bronze Globe Valve, is designed with a convenient slip-on, stay-on disc holder that permits a quick change of disc. The resilient composition disc assures drop-tight closure. The sturdy screw-over bonnet is unaffected by repeated disassembly and reassembly.

Jenkins PRACTICAL PIPING LAYOUTS

39

Illustrating the proved 3-point formula for trouble-free, time-defying hookups

A Use the right type valve for the service.
B Place valves correctly in the line.
C Choose Jenkins Valves for lifetime economy.

Fig. 106-A
Renewable
Composition Disc
BRONZE GLOBE
VALVE
150 Pounds Steam
300 Pounds O.W.G.

A CHOICE OF OVER 500 VALVES

To save time, to simplify planning, to get all the advantages of Jenkins specialized valve engineering experience, select all the valves you need from the Jenkins Catalog. It's your best assurance of *lowest cost in the long run.*

Jenkins Bros., 80 White Street, New York 13; Bridgeport, Conn.; Atlanta; Boston; Philadelphia; Chicago; San Francisco.
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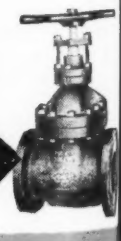
TRADE JENKINS MARK



Jenkins Bros

HOT WATER CIRCULATION LOOP

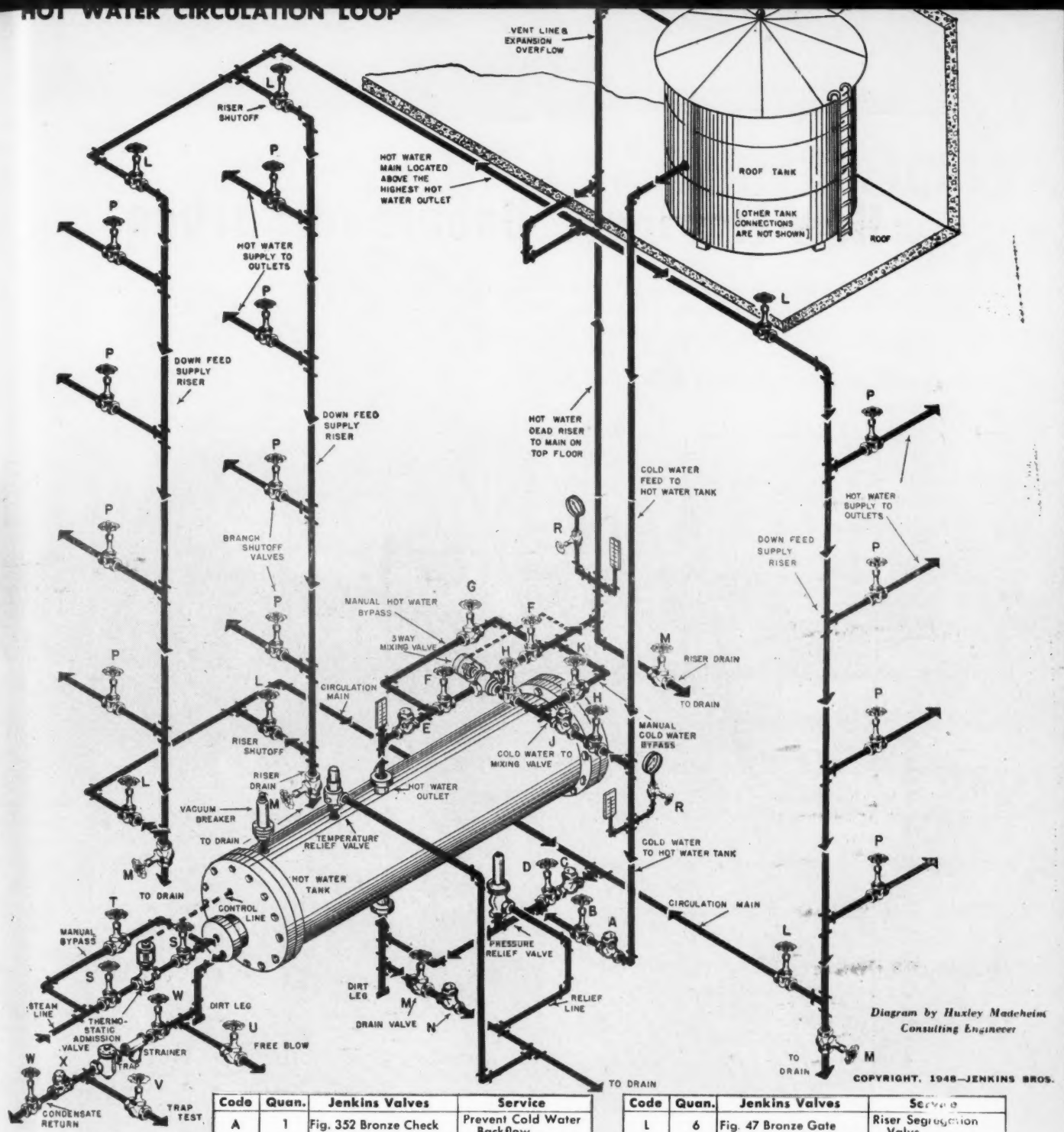


Diagram by Huxley Madeheim Consulting Engineer

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Code	Quan.	Jenkins Valves	Service
A	1	Fig. 352 Bronze Check	Prevent Cold Water Backflow
B	1	Fig. 47 Bronze Gate	Cold Water Shutoff
C	1	Fig. 352 Bronze Check	Prevent Hot Water Backflow
D	1	Fig. 47 Bronze Gate	Hot Water Shutoff
E	1	Fig. 352 Bronze Check	Prevent Hot Water Backflow
F	2	Fig. 47 Bronze Gate	Modulating Valve Shutoff
G	1	Fig. 106-A Bronze Globe	Manual ByPass
H	2	Fig. 47 Bronze Gate	Cold Water Shutoff
J	1	Fig. 352 Bronze Check	Prevent Cold Water Backflow
K	1	Fig. 106-A Bronze Globe	Manual ByPass

Code	Quan.	Jenkins Valves	Service
L	6	Fig. 47 Bronze Gate	Riser Segregation Valve
M	5	Fig. 106-A Bronze Globe	Riser Drains
N	1	Fig. 352 Bronze Check	Prevent Drain Backflow
P	12	Fig. 47 Bronze Gate	Branch Shutoffs
R	2	Fig. 743G Bronze Needle	Pressure Gage Control
S	2	Fig. 47 Bronze Gate	Thermostatic Valve Shutoff
T	1	Fig. 956 Bronze Globe	Thermostatic ByPass
U	1	Fig. 106-A Bronze Globe	Free Blow
V	1	Fig. 106-A Bronze Globe	Trap Test
W	2	Fig. 47 Bronze Gate	Trap Shutoff
X	1	Fig. 92 Bronze Check	Prevent Condensate Backflow

LVE RECOMMENDATIONS
etails and valves to suit varying
ditions see Jenkins Catalog

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BRONZE • IRON • STEEL

125 TO 600 LBS. STEAM PRESSURE

FOR EVERY INDUSTRIAL, ENGINEERING, MARINE, PLUMBING-HEATING SERVICE

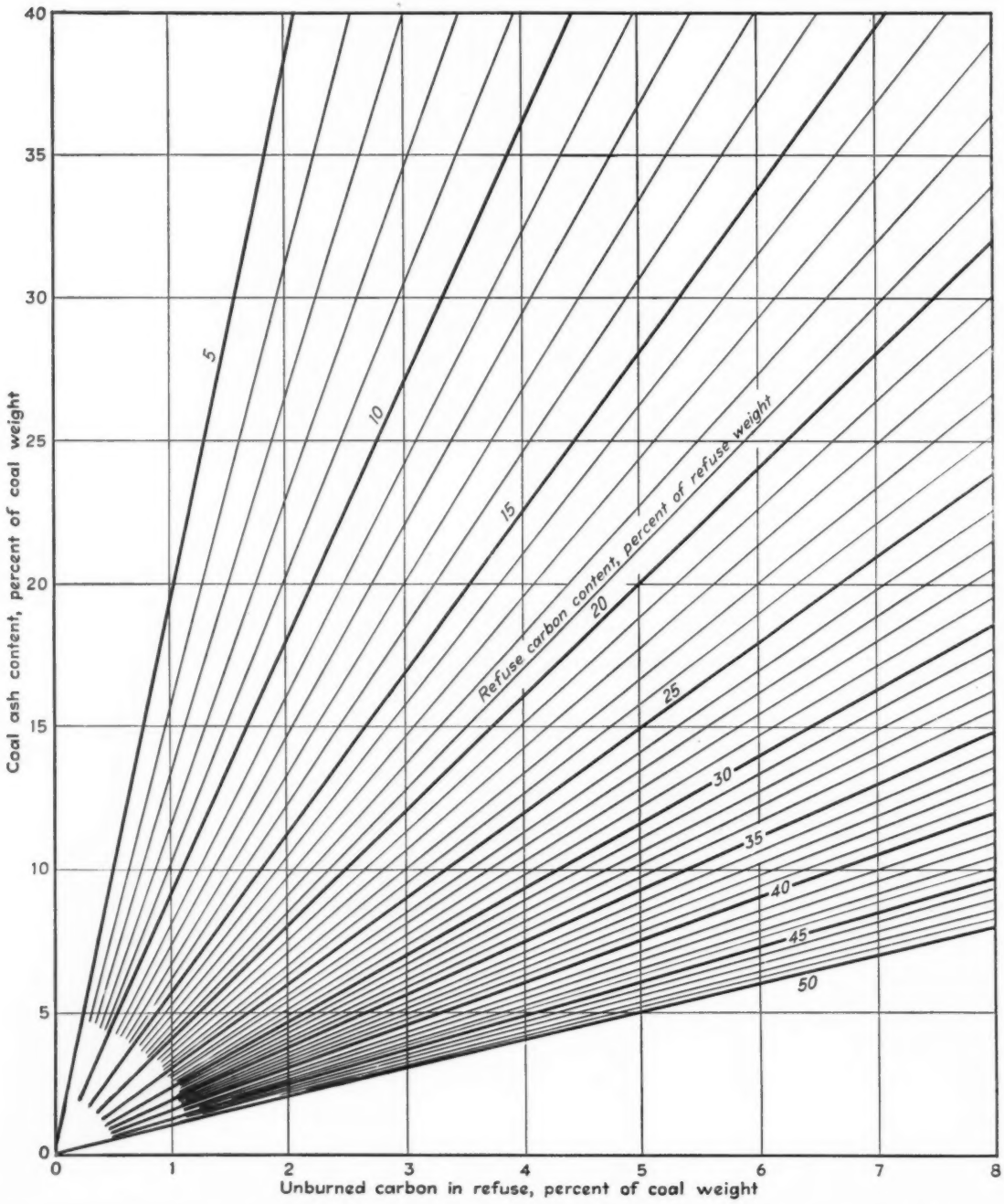
SOLD THROUGH RELIABLE INDUSTRIAL DISTRIBUTORS EVERYWHERE

Number 195

How to Figure Unburned Carbon

Here's a chart to help simplify calculating the unburned carbon per pound of coal when the unburned carbon (associated with the ash) per pound of refuse is known. This simple relation often causes confusion because of the different bases on which the percentages are calculated. This graph will keep it straight.

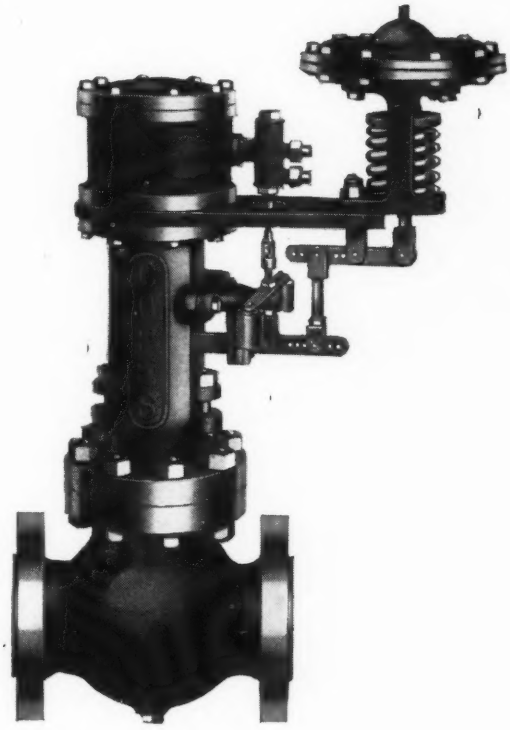
—By H Richardson



© POWER

For more exacting

PRESSURE REDUCING JOBS



Type R-DSLH, relay-operated for remote control
Below: Type DBI is direct-operated and self-contained

COPES Pressure Reducing Valves are designed for tough jobs demanding greater accuracy and dependability than can be obtained with ordinary stock valves. They are built to give as good results under emergency conditions as in normal service—to avoid objectionable vibration, noise and wear. Each is engineered for the individual installation, to assure close pressure control and long service life with minimum maintenance.

The COPES line is complete, covering a controlled pressure range from 27 inches of mercury vacuum to 600 psig. Valves are direct- or relay-operated, self-contained or actuated by a master control—as dictated by the individual operating conditions. Write for Bulletin 477.

ENGINEERED BY THE MAKERS OF COPES

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NORTHERN EQUIPMENT COMPANY
1081 GROVE DRIVE, ERIE, PA.
BRANCH PLANTS: Canada, England, France and Austria
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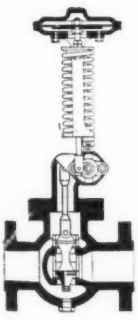
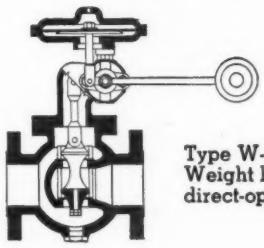
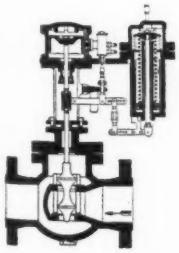
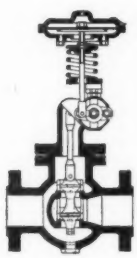




Type W-DBI. Weight loaded, direct-operated



Type 3-SH-2C for heavy duty. Relay-operated, self-contained



Type R-DBI for remote control from master

COPES

Headquarters for . . .

Boiler Feed Water Control . . . Excess or Constant Pressure Control, Steam or Water . . . Liquid Level Control . . . Balanced Valves . . . Desuperheaters . . . Boiler Steam Temperature Control . . . Hi-Low Water Alarms.

POWER NEWS

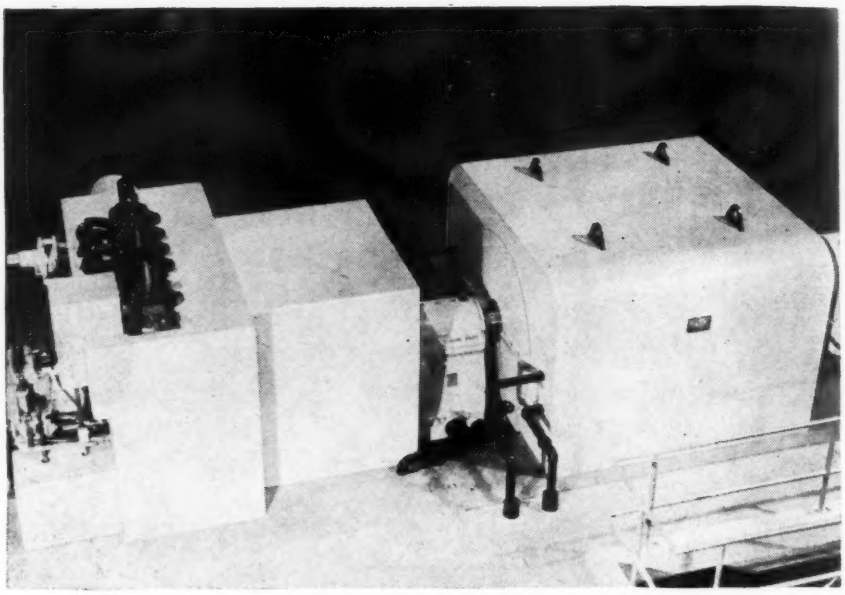
BUSINESS ITEMS • APPOINTMENTS • FOREIGN FIELDS
WASHINGTON NOTES • NEW DEVELOPMENTS • CONVENTIONS

Power Show Offers New Products for New Savings

▶ THE 18TH NATIONAL EXPOSITION of Power and Mechanical Engineering, at Grand Central Palace, New York City, Nov 29-Dec 4, will reveal many ways to help check the inflation spiral at one of its numerous sources, as exhibitors emphasize equipment designed for new economies in production, transmission and regulation of power.

Exhibits range over the entire field from firebox to pushbutton on the last motorized units in the plant. Included will be a comprehensive display by a large producer of refractories, a new stoker shown for the first time, a well-known steam engine, and additional exhibits of selfcontained burner-boiler units. New economies will be reflected in the long list of specialties, piping and valves, automatic recorders and controls, instruments for many purposes. Improved construction will be featured in pumps and compressors, fuel- and materials-handling equipment, variable transmissions and drives, as well as other power and power-plant machinery.

(*Continued on page* 178)



Turbine-Generator Has Inclosed Air Coolers

Feature of this 2400/4160-v, 3600-rpm turbine-generator, installed at South Gate, Calif. plant of U. S. Gypsum Co, is its totally inclosed cooler design now standard for Allis-Chalmers housing-type turbine-generators up through 7500 kw. In the small sizes, cooler connections are brought into housing at the side, but in the larger units, even connections are inclosed. This design eliminates need for pit or basement mounting of separate coolers. Unit is an impulse-reaction, non-condensing turbine for 400-psig 750-F throttle steam and 25-psig back pressure. A nozzle is provided for uncontrolled extraction at about 175 psig at the rated load

COMING EVENTS

Oct 3-6—American Society of Mechanical Engineers, petroleum div meeting, Herring Hotel, Amarillo, Texas. O B Schier, 29 W 39th St, New York 18, New York.

Oct 5-7 — American Institute of Electrical Engineers, Middle Eastern district meeting, Hotel Statler, Washington, D. C. H H Henline, secretary, 33 W 39th St, New York 18, N. Y.

Oct 5-7—New England Materials Handling Exposition, Mechanics Hall, Boston, Mass. E S Whitten, publicity chairman, NEMHE, Mechanics Hall, Boston, Mass.

Oct 11-13—National Lubricating Grease Institute, 16th annual convention, Edgewater Beach Hotel, Chicago, Ill. Carl E Bolte, executive secretary, 4638 Mill Creek Parkway, Kansas City 2, Mo.

Oct 18-20—Engineers' Society of Western Pennsylvania, ninth annual water conference, Hotel Wm Penn, Pittsburgh, Pa. H M Olson, chairman of water conference, c/o Ohio Salt Co, Pittsburgh, Pa.

Oct 18-22—American Institute of Electrical Engineers, Midwest general meeting, Hotel Schroeder, Milwaukee, Wis. H H Henline, secretary, 33 W 39 St, New York 18, N. Y.

Oct 18-22—National Safety Congress & Exposition, meetings in Stevens, Congress, Palmer House, Morrison and Sherman Hotels, Chicago, Ill. G E Burns, 20 N Wacker Dr, Chicago.

Oct 28-29—Prime Movers Committee, Pennsylvania Electric Assn, fall meeting, Carver House, Warren, Pa. John W Mikels, vice-chairman, New Castle, Pa.

Nov 3-5 — American Institute of Electrical Engineers, southern district meeting, Tutwiler Hotel, Birmingham, Ala. H H Henline, secretary, 33 W 39th St, New York 18, N. Y.

Nov 28-Dec 4—American Society of Mechanical Engineers, annual meeting, Pennsylvania and New Yorker Hotels, New York, N. Y. Ernest Hartford, executive assistant secretary, 29 W 39th St, New York 18, N. Y.

Nov 29-Dec 4—18th National Exposition of Power & Mechanical Engineering, Grand Central Palace, New York 17, N. Y. Charles F Roth, manager, Grand Central Palace, New York.

Dec 5-8—American Society of Refrigerating Engineers, meeting, Statler Hotel, Washington, D. C. W S Woodside, 801 Whittaker Bldg, Baltimore, Md.

Facts about J-M Insulations Subject: ENGINEERING and APPLICATION

Efficient insulation must be engineered to the job

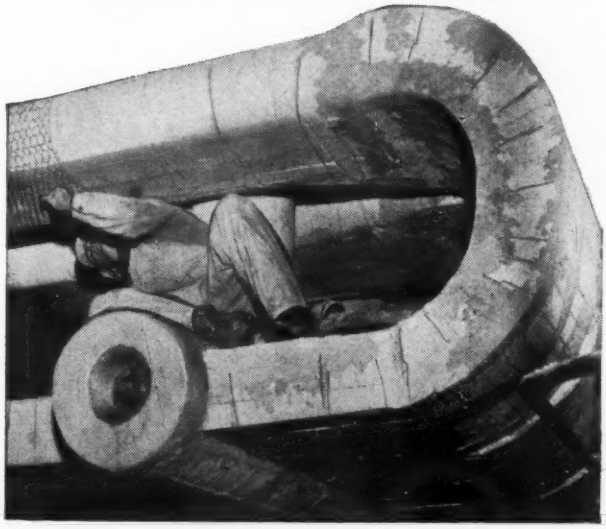
Any insulation will save *some* money. But only the right insulation, specifically engineered for a specific job, will save the most money for the longest time.

Operating conditions and service temperatures vary widely throughout industry. From no single raw material can an insulation be produced that will operate efficiently under all of them. Using asbestos and other selected raw materials as a base, Johns-Manville manufactures *many* insulations . . . each designed for a special purpose. These insulations span the entire range of temperatures from 400°F. below zero to 2600°F. above.

When you specify "*Insulation by Johns Manville,*" you are sure of getting the material that's engineered for the temperature and service conditions of your job.

Efficient insulation must be skillfully applied

After the proper insulation has been selected, it must be skillfully applied throughout the entire system for maximum efficiency.



Across the nation there is a network of contracting firms specializing in the correct application of J-M insulations. These contractors employ skilled mechanics who are experienced in the proper application of J-M insulations in all types of service.

For more information on how this J-M insulation service can be of help to you in connection with your insulating problems, write to Johns-Manville, Box 290, New York 16, N. Y.

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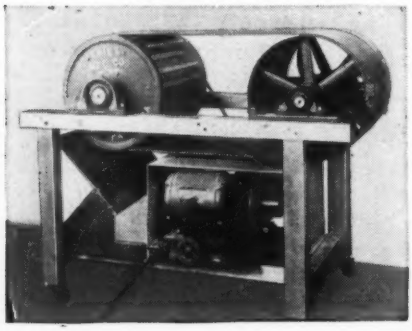
Johns-Manville *First in* **INSULATIONS**

with no straight-run limitations. Accuracy is constant over entire range of commercial flow measurement. Manufacturer states that the tube can serve as well or better than a venturi tube. **Bethlehem Foundry & Machine Co, Bethlehem, Pa.**

CO_2 Indicator E351

INDICATOR IS CONSTRUCTED of transparent acrylic material with metal parts of non-corroding stainless steel. Pressure tight "O" rings are used as seals. Indicator is 8 in. long and 2 in. in diameter. It has a 4-in. scale calibrated to one-fifth of 1% CO_2, and accuracy is stated to be one-half of 1% CO_2. **F W Dwyer Mfg Co, 317 South Western Ave, Chicago 12, Ill.**

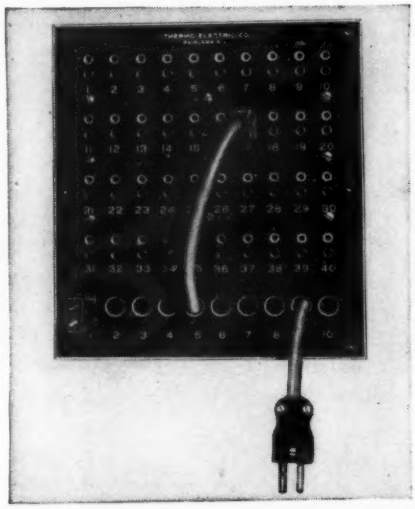


Magnetic Pulley E352

PERMANENT-MAGNETIC PULLEY UNIT removes fine iron or less-magnetic particles and affords automatic separation of ferrous from non-ferrous material ranging in size from 10 to 200 mesh. Designed for service as a head pulley in belt-conveying systems, the unit is available in 18- and 24-in. diameters and in belt widths of 12 to 60 in. Pulley is crowned to prevent belt weaving and belts of any non-magnetic material may be used. Shaft diameters are standard to permit replacement of non-magnetic pulleys in existing installations without changing bearings or shaft mountings. **Eriez Manufacturing Co, Erie, Pa.**

Water-Level Indicator E353

TO EXTEND THE SERVICE of its remote liquid-level indicator, the company has developed a new attachment for operation of one or more distantly located electric visible or audible high-low alarm signals and/or controllers for pump motors or other devices. Control unit consists of simple 2-pole curved-bar permanent magnet fixed to shaft of indicator pointer and actuating one or the other of two sealed-in-glass mercury switches that in turn operate the *Hi-Lo* alarm signals installed at remote locations. Red and green or amber lights give visual indication; audible signal uses two vibrating horns of different tones, or a single horn for both high and low levels. **Yarnall-Waring Co, Chestnut Hill, Philadelphia 18, Pa.**



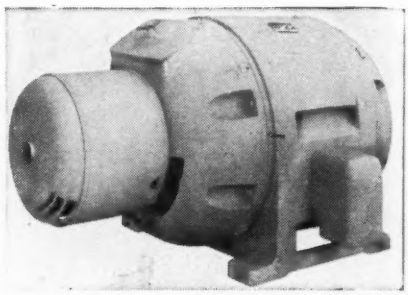
Thermocouple Panel E354

PROVIDING A QUICK and flexible method for easily connecting any thermocouple of a group to any position on multiple recorders or indicating and controlling pyrometers, the panel is suited for plant service in checking temperatures of industrial heat-treating processes, chemical processes, power plants and oil refineries.

Designed for flush mounting, the panels are available in various combinations with any desired number of jacks and plugs. Rubber-covered cables have a finger-grip bakelite plug which reaches any connector jack on panel. The panelboard is ¼-in. thick, black-and-white laminated bakelite. **Thermo Electric Co, Fair Lawn, N. J.**

Piston Rings E355

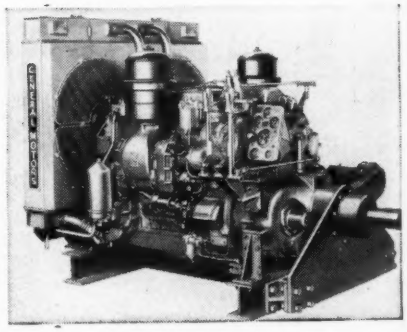
PEDRICK CHROME-FACED piston ring has, it is claimed, an efficient life two to four times longer than others. This results from high antifriction and lubricant-retaining properties of chrome face. It is further claimed that the chrome plating reduces cylinder wear and wear of all other rings in the installation. Centrifugally-cast ring is of a new alloy developed to make full use of wearability of chrome facing. It is said to be safe from breakage because it is not subject to hydrogen embrittlement when chrome plated. Twist-seal design provides definite point contact between ring face and cylinder wall and between ring sides and groove surfaces. **Wilkening Mfg Co, Philadelphia, Pa.**



Synchronous Generator E356

AVAILABLE IN STANDARD RATING from 20 to 1000 hp at 60 cycles with speeds of 514 to 1800 rpm, this new line of general-purpose, high-speed synchronous motors and generators forms the 900 series. Generators are available in ratings from 12½ to 1250 kva.

Having tripproof construction, the motors incorporate the usual *Tri-Clad* feature. Direct-connected and belt-driven exciters are available for all ratings. **General Electric Co, Schenectady 5, N. Y.**

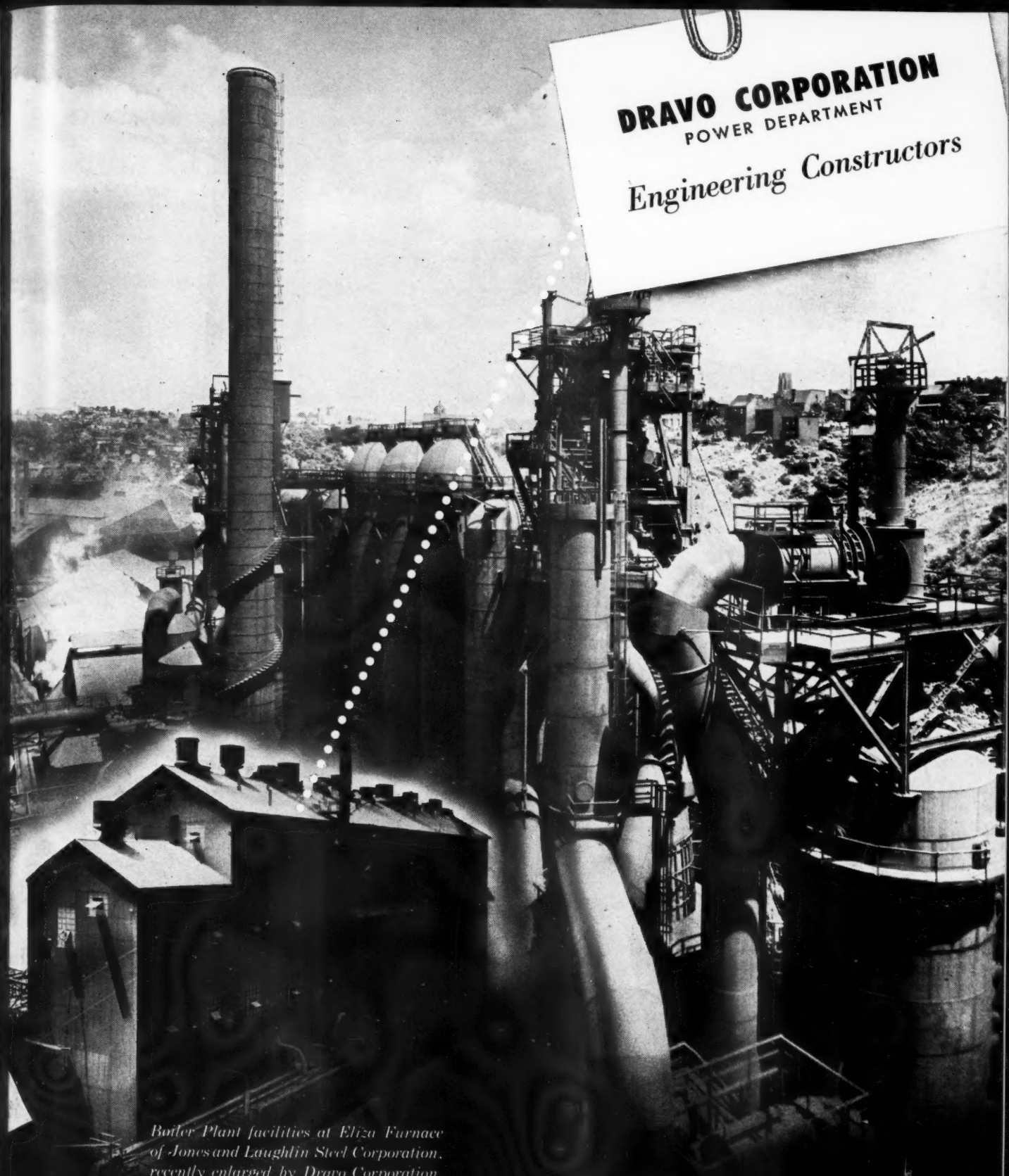


Industrial Diesel E357

NEW MULTIPLE-ENGINE UNIT (Model 8-103) consists of two GM Series 71 4-cylinder diesels mounted side by side on a common base and geared to a single output shaft. Unit is rated at 170 bhp continuous output.

Purchasers have a choice of four different power-takeoff arrangements: (1) The *HD* or heavy-duty power takeoff is designed to take pulley or chain-drive side thrust without need for special cradle-mounted sheave or sprocket. (2) The *SS* or stub shaft may accommodate any of the various couplings used with industrial machinery. (3) The *OH* or *SAE "O"* size housing will support any close-coupled power takeoff within proper horsepower range. This type

Use convenient reply cards on page 206a to secure additional information on these new equipment items. Please be sure to identify your request with the new-equipment key letter, *E*, and number, as shown on the items above.



DRAVO CORPORATION
POWER DEPARTMENT

Engineering Constructors

Boiler Plant facilities at Eliza Furnace of Jones and Laughlin Steel Corporation, recently enlarged by Dravo Corporation.

DRAVO
CORPORATION

DRAVO BUILDING, PITTSBURGH 22, PA.

Engineering Constructors of power plants, boiler plants, central stations, compressor stations, water pumping stations — fabricators and erectors of power piping — power and boiler plant equipment.

DRAVO

Pittsburgh, Philadelphia, Cleveland, New York, Detroit

is particularly suitable for applications with torque converters. (4) The *DF* or drive flange is available for installations where the driven machinery is to be coupled directly to power unit. Transfer gear cases may be obtained with gear ratios of 1 to 1, 1.33 to 1, 1.76 to 1, or 2 to 1.

These *Twin* 4 units are offered with either right or left rotation and may be equipped with electric, air or gasoline starting devices. **Detroit Diesel Engine Div, General Motors Corp, 13400 West Outer Drive, Detroit 28, Mich.**

Magnetic Starter E358

DESIGNED FOR NON-REVERSING, across-the-line starting of polyphase and single-phase squirrel-cage induction motors, the starters are suitable for use with separate pilot devices for 2- or 3-wire remote control, or can be supplied with local control pushbutton stations or selective switches.

Bulletin 4111 starters feature high-arc-interruption capacity, fast, positive and consistent operation as well as reliable thermal overload protection. Each unit has a maximum enclosed rating of 7½ hp; 440-550 v, 3-phase, 60 cycles. Standard operating coils can be furnished for 110, 208-220, 440 and 550 v; 25- 50- or 60-cycle service. Dual-voltage coils can be supplied for 110/220 or 220/440-v, 60-cycle duty. **Ward-Leonard Electric Co, Mt. Vernon, N. Y.**

Light-Beam Wattmeter E359

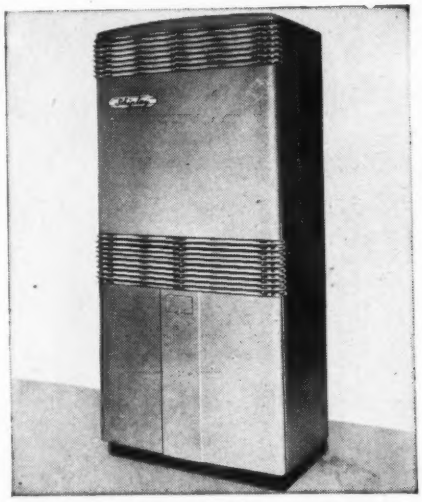
DESIGNED TO MEET industry's need for a portable, accurate instrument, light-beam wattmeter is suitable for use in low-wattage and low-power factor ranges at frequencies of 25 to 3000 cycles.

This meter may serve in instrument-calibrating laboratories as a transfer standard from dc to ac for calibration of other wattmeters. It is also suitable for testing small reactors, relays, selsyns, etc. Contained in a walnut case, the instrument comes in two sizes: a large, high-sensitivity model and one of smaller size. Binding post and the light source are mounted on an insulating plate in rear of instrument.

Meter's scale is about 11 in. long. Indicating element is built on air-core electrodynamic principle with a taut suspended air-dampened moving element. Few metal parts are used, further reducing eddy current and hysteresis losses. Light beam is triple reflected from front surface mirrors, producing a sharp line image on the translucent scale. **General Electric Co, Schenectady 5, N. Y.**

Oil Circuit Breaker E360

TYPE FZO-151 high-voltage, high-speed, quick-clearing, outdoor frame-mounted oil circuit breaker, previously rated from 500,000 to 1,500,000 kva interrupting capacity, is now available in interrupting capacities to 2,500,000 kva. This breaker is of all-welded steel including top-frame insulated support. It is equipped with the new improved *Ruptor* interrupting device capable of ultra-high-speed circuit interruption. It is provided with a high-speed, mechanical trip-free electro-pneumatic operator that permits 20-cycle fast reclosing service. Solenoid operation is also available for standard reclosing service. **Allis-Chalmers Mfg Co, Milwaukee, Wis.**

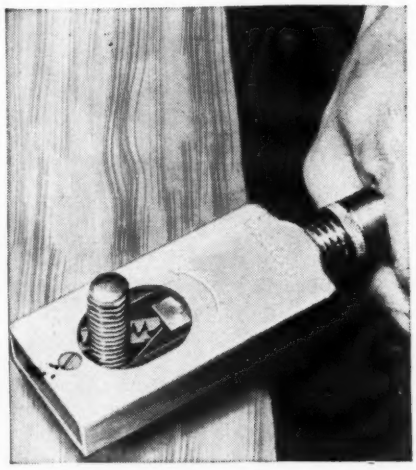


Packaged Air Conditioners E361

TWO-STAGE hermetically-sealed compressor powers new line of packaged Shipley air conditioners, available in 3, 5, and 7½ hp sizes. Compressor design is said to save water, give efficient results at high loads. Units are light in weight, ranging from 884 to 950 lb, and enclosed in the same size green cabinet. **York-Shipley, Inc, York, Pa.**

Pump Control E362

A WATER COLUMN REPLACEMENT based on an older working design gives (1) float-operated pump control (2) low-water fuel cut-off through suitable electrical connections (3) low-water alarm (4) any combination of the three for boilers up to 150 psi. **McDonnell & Miller, Inc, Wrigley Bldg, Chicago 11, Ill.**



Thread Cleaner E363

THIS THREAD CLEANER restores flattened, distorted or badly rusted right- or left-hand threads on bolts or studs up to 2 9/16 in. diameter. Threader is easily set and held to size by a single lock nut on knurled handle. All working parts are finely machined and hardened. It comes in two sizes with bolt capacities of 1 and 2 9/16 in. **Buckingham Mfg. Co, Binghamton, N. Y.**

Welding Rod E364

FLUX-COATED, thin-flowing, low-melting brazing alloy makes up the welding rod, *Eutecrod* 1805*FC*, designed for joining copper. Alloy has a tensile strength of 90,000 psi and a Brinell hardness of 160-180. It comes in sizes of $\frac{1}{4}$, $\frac{5}{16}$, $\frac{3}{32}$ and $\frac{1}{8}$ in. flux coated and $\frac{1}{16}$ in. bare. **Eutectic Welding Alloys Corp, 40 Worth St, New York 13, N. Y.**

Synchronous Differential E365

CONSISTING OF TWO SYNCHRONOUS MOTORS and a mechanical differential, the unit is used in synchronizing of engines, the synchronous differential serving as an intermediary regulating device of engine control equipment. A single frame houses the entire unit, which weighs but 28 oz; it is $3\frac{13}{16}$ in. long and $2\frac{3}{8}$ in. in diameter.

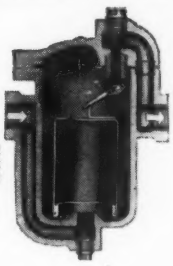
Each of the two synchronous motors reflects operating speed of an engine. The motors in turn move a ¼-in. threaded out-

(*Continued on page* 184)

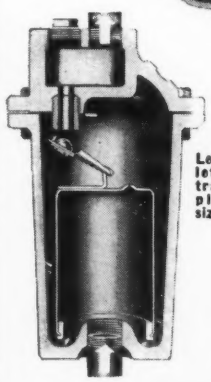
Use convenient reply cards on page 206a to secure additional information on these new equipment items. Please be sure to identify your request with the new-equipment key letter, *E*, and number, as shown on the items above.

WHY ARMSTRONG TRAP MECHANISMS *last so long!*

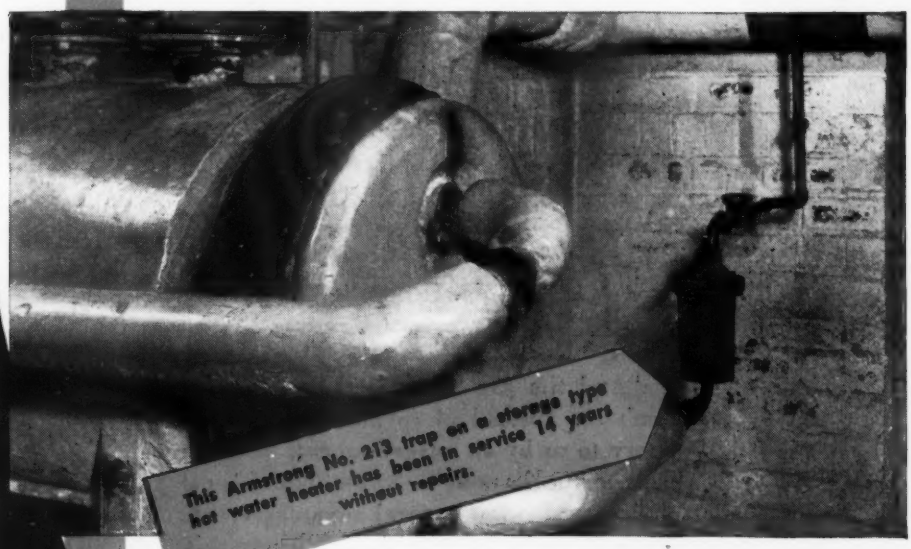
CHOICE OF BODY STYLES



Right: Side Inlet — Side Outlet traps for in-line installation.



Left: Bottom Inlet — Top Outlet traps in a complete range of sizes.



This Armstrong No. 213 trap on a storage type hot water heater has been in service 14 years without repairs.

WHAT USERS SAY

36 Armstrong Traps on heating system service in an Atlanta building still going strong without maintenance after 10 years.

* * *

One minor repair job in 20 years —that's the record of the Armstrong traps in service at South Dakota hospital.

* * *

Standardization on Armstrong traps slashed maintenance—first trap operating over 15 years without repairs—Canadian foundry.

SEND FOR the Armstrong Steam Trap Book—36 pages on trap selection, installation and maintenance. Free on request.

. . . They're built to stand 1500 psi, 1000°F

The user of standard Armstrong steam traps for medium and low pressure service reaps the benefit of the research, investment and experience that went into the development of Armstrong forged steel traps for high pressure generating station service.

The valves and seats in all Armstrong traps are chrome steel, hardened, ground and lapped to a precision fit. The inverted buckets and valve lever assemblies are all corrosion resistant 18-8 stainless, heavily reinforced for wear. In normal service these mechanisms often last for years without attention. And when a valve finally wears to the point where it fails to seat properly, it is usually good for a relapping—a job any maintenance man can do in a few minutes. Or replacement is a simple, inexpensive job.

It's this built-in quality of Armstrong traps that keeps them on the job without leaking steam, without sticking or clogging, without frequent maintenance. Quality pays dividends when it comes to steam traps. Plan now to standardize on Armstrong, the *quality* traps. Call your Armstrong representative or write:

ARMSTRONG MACHINE WORKS

812 Maple St., Three Rivers, Michigan

ARMSTRONG · INVERTED BUCKET · STEAM TRAP

ARMSTRONG STEAM TRAPS

The High-Speed Way of Spreading Useful Information

In a noon-time bull session the other day, one of the boys threw out this for the rest of us to chew on: "Why don't we get rid of all advertising? If we did, our food and clothing would be cheaper—fuel oil here in the plant wouldn't cost as much, and that new motor we're putting in wouldn't be as expensive as it is."

Well, we went around on that one for quite a few minutes until someone said, "OK, let's look at the situation if there were no advertising. You'd have no other way of getting product information than by word-of-mouth through salesmen. The Chief would be doing nothing but talking to salesmen all day long trying to find out the same things he learns now by reading advertisements.

"And the gag about things being cheaper without advertising just isn't so. Instead of spending a penny or two in getting his product story to us by an advertisement, he'd spend several dollars. When the salesman calls now, we know about his company, where his products are being used, what general advantages and possibilities for savings there are—because of advertising. Without this pre-information, the salesman would have to cover this same ground and would need double or triple as much time per customer. Result would be the maker of our new motor would need many more salesmen, which would make things cost more, not less.

"Advertising is really 'mechanized spreading of information'—a fast moving process of disseminating engineering data, new methods, improved procedures. Any other way of doing the job would take so much time that it would slow up the speedy tempo of today's business life.

"Sure, advertising gets kind of corny and pointless sometimes—but look at all the swell, helpful pieces we see in every issue of our magazines. And did you know we got that new motor only because Jim over there noticed an ad pointing out how to avoid troubles we've been having for years with dirt and corrosion? The Chief called in a salesman, and there's the motor."

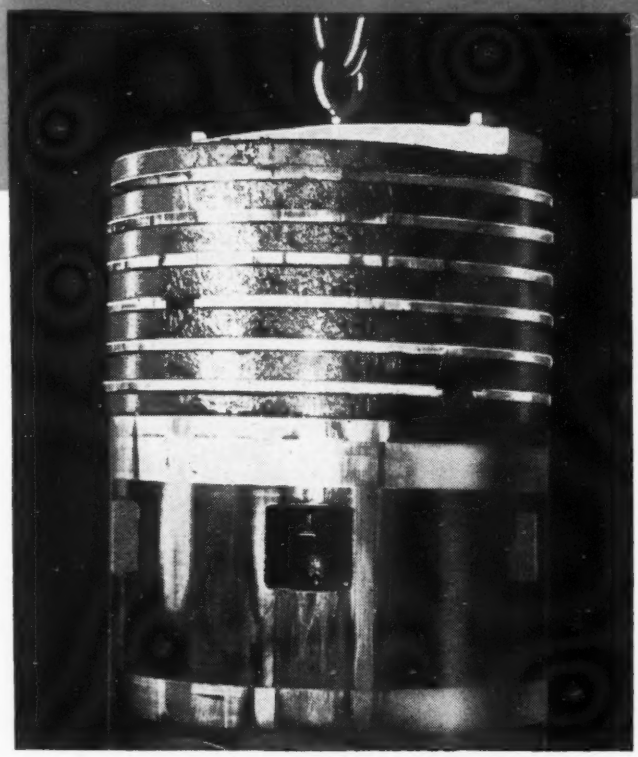
George Edwards

Engineer

step up efficiency

step down costs

Keep rings free with Texaco Ursa Oils



Piston being pulled from Nordberg 5-cylinder, 1250 hp, 2-cycle Diesel after operating 11,000 hours at 90% load . . . lubricated with *Texaco Ursa Oil*. All rings are free in their grooves. Brightness of rings and copper bands indicates perfect contact with cylinder liner . . . for full compression, top efficiency and economy.

WHEN you look at the parts of a Diesel that has run thousands of hours lubricated with *Texaco Ursa Oils,* you'll find them in A-1 condition . . . rings still free . . . valve stems clean . . . cylinder walls bright and smooth . . . bearings still good for further service.

Texaco Ursa Oils are made to stand up under heat and pressure . . . to stand off sludge, varnish and carbon formations. Their use assures high efficiency, low fuel consumption, low maintenance costs.

Texaco Ursa Oils are approved by all leading Diesel manufacturers, and—

More stationary Diesel hp in the U. S. is lubricated with Texaco Ursa Oils than with any other brand.

Let a Texaco Lubrication Engineer help you step up your Diesel efficiency, step down your costs. Just call the nearest of the more than 2300 Texaco Wholesale Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO Ursa Oils

FOR ALL DIESEL ENGINES

Tune in...Texaco Star Theatre every Wednesday night starring Milton Berle. See newspaper for time and station.

FOR MAXIMUM LIGHT AND VENTILATION

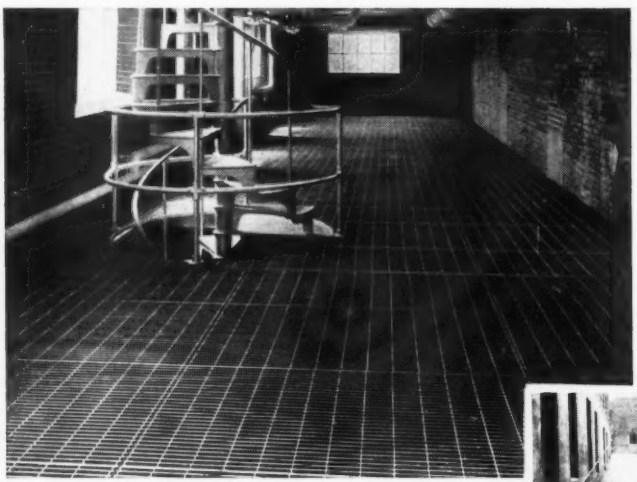
use Hendrick Open Steel Flooring

Its 90% open area offers minimum obstruction to the passage of light from floor to floor—and assures ample ventilation. Its Mitco pressure-formed construction provides rugged, integral panels that will support heavy loads without any lateral deflection. The rectangular, square-edge bars give a thoroughly safe, non-slipping, level walking surface.

There are no bolts, rivets or angle irons to loosen, or to collect dirt and refuse—no welds, liable to have residual stresses and lead to warping.

Hendrick Shur-Site Treads for stairs, ladders and fire escapes, have all Hendrick Mitco advantages. A heavy, flanged nosing-bar, that makes the edge of each tread conspicuous, is an additional safety feature.

For circular walkways Hendrick furnishes Mitco Radial Grating. Hendrick Driveway Grating has extra heavy bars, capable of sustaining the heaviest loads. Where light weight, or corrosion resistance, is of prime importance, Hendrick Mitco grating can be made of aluminum.



Hendrick Armorgrids withstand heaviest traffic

Unequalled for floors, loading platforms, ramps and driveways that have to withstand grinding loads, heavy shocks and continuous wear, Hendrick Mitco Armorgrids never require replacement. They do not depend on the fill for development of full strength for resisting shock loads.

Write for a copy of
Hendrick Mitco Products Catalogue

SEE OUR CATALOG IN SWEET'S

HENDRICK
Manufacturing Company
46 DUNDAFF STREET, CARBONDALE, PENNA.
Sales Offices In Principal Cities

Perforated Metals
Perforated Metal Screens
Architectural Grilles
Mitco Open Steel Flooring,
"Shur-Site" Treads and
Armorgrids

Engineer's Bookshelf

(*Continued from page* 144)

and maintenance of electronic tubes and apparatus. Many chapters have extensive reference lists.

BATTLEFRONTS OF INDUSTRY. *By David O Woodbury. 333 pages, 6x9, illust., $3.50. John Wiley & Sons, Inc, 440 Fourth Ave, New York 16, N. Y.*

Since he left the news editorship of POWER in 1929 for a distinquished career as a free-lance writer of science books and science articles for the general reader, Dave Woodbury has contributed greatly to the general understanding of what makes the wheels go round in the modern world. His six previous books are: *Communication, The Glass Giant of Palomar, The Colorado Conquest, What You Should Know About Submarine Warfare, Beloved Scientist,* and *Builders for Battle.*

In every one of his books Mr Woodbury has revealed his rare combination of talents—skill with words, clearness, dramatic sense and a real understanding of basic science and engineering. This last reflects his two engineering degrees from the Massachusetts Institute of Technology.

In the 333 text pages of *Battlefronts of Industry,* he sets down the history of Westinghouse's contributions to victory in World War II. It is a thorough and detailed job—sound, carefully checked and easily read. The over-all picture of Westinghouse contributions is highly impressive.

Touching only the high spots here for lack of space, these include high-speed gun mounts, naval guns, plane landing catapults, turbines and guns for warships, tank guns, stabilizers, radar equipment, electric torpedoes, binoculars, wind-tunnel motors, X-ray development, searchlights, uranium.

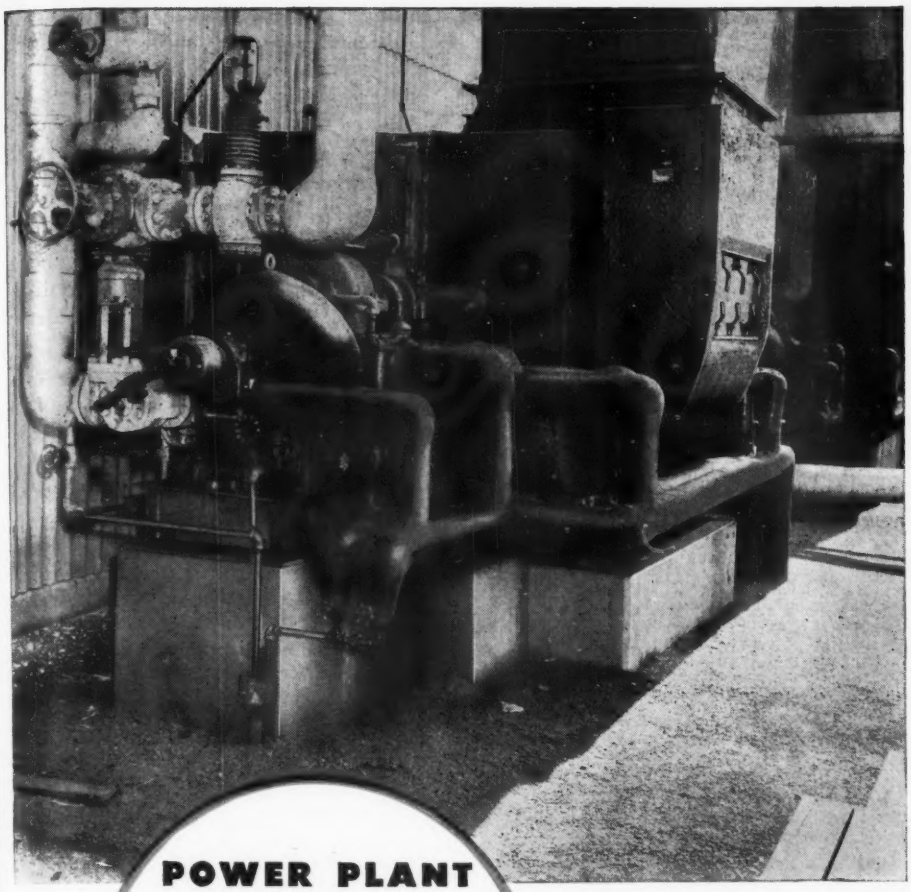
Technical Briefs

(*Continued from page* 142)

load conditions, to maintain reasonable fuel consumption and avoid overloading the motor. This is most conveniently done by throttling with a butterfly valve, in either blower suction or discharge. Adjustment is mainly to compensate for atmospheric variations and a conveniently located ammeter to show motor current proves a rough but reliable guide to throttle setting, automatic control not being necessary.

The scheme shown in the diagram has been devised to overcome problems normally associated with a large blower motor connected to the plant bus. These are: (1) inability to start without outside power source in event of complete plant shutdown (2) unexpected loss of

AIR EQUIPMENT TO HELP YOUR BUSINESS



"Buffalo" Induced Draft Fans Make Possible Increased Boiler Capacities

POWER PLANT DRAFT

You can count on!

"Buffalo" FANS LAST LONGER —CUT POWER COSTS

The boiler room is no place for a fan that can't *take it!* That's why it pays to specify "Buffalo" when you need Forced Draft, Induced Draft or Cinder-Eliminating Fans. They're built with heavy metal *properly distributed*—extra heavy at wear points. They're high in efficiency, too—an all-around saving to you in power-producing costs. Let us send you literature on the cost-cutting draft fan you need—write:

BUFFALO FORGE COMPANY

488 Broadway, Buffalo, N. Y.

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

Branch Offices in all Principal Cities

FANS by "Buffalo"

EQUIPMENT FOR

- ★VENTILATING
- ★HEATING
- ★COMFORT COOLING
- ★PROCESS COOLING
- ★AIR TEMPERING
- ★AIR WASHING
- ★EXHAUSTING
- ★BLOWING
- ★FORCED DRAFT
- ★INDUCED DRAFT
- ★PRESSURE BLOWING
- ★CLEANING
- ★DRYING

JTTING AIR COSTS IN EVERY BRANCH OF INDUSTRY

Hi-Test KEWANEE

FOR POWER and PROCESS STEAM

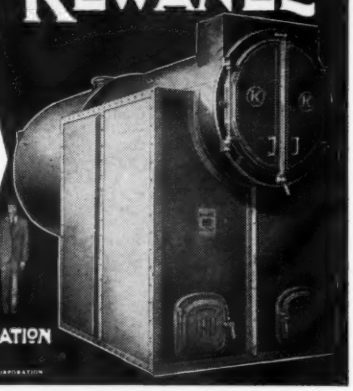
6 Sizes for 50 to 150 H.P., 125 and 150 lbs. W.P.... a quick steaming, all-welded portable type with firebox for refractory lining. A fuel saver.

80 Years Boilermakers

WRITE DEPT. 89-K10 for 6" scale with pipe diameter markings.

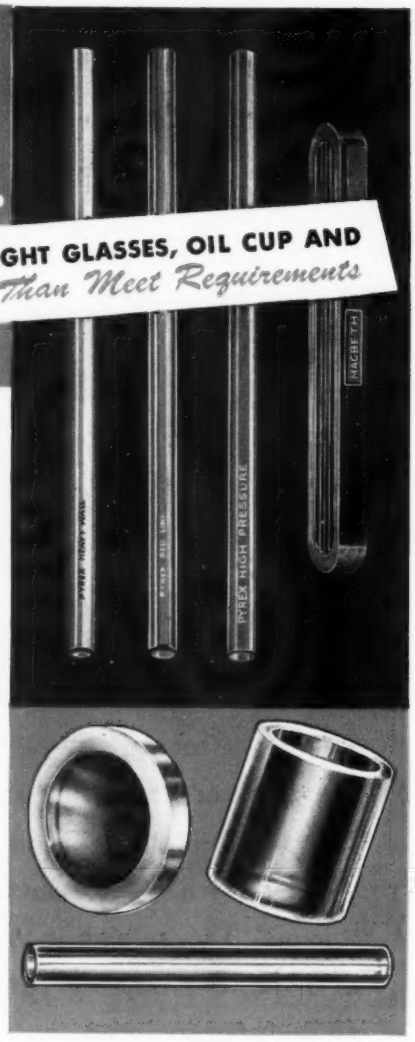
WON FOR 5th TIME

KEWANEE BOILER CORPORATION
KEWANEE, ILLINOIS



For Long Service Life...

CORNING GAUGE GLASSES, SIGHT GLASSES, OIL CUP AND LUBRICATOR GLASSES *More Than Meet Requirements*



For trouble-free service, always specify Corning products when you need gauge glasses, sight glasses, oil cup and lubricator glasses. Made to exacting standards and tested for pressure and temperature shock, you can be sure that the product you select will stand up.

GAUGE GLASSES: Pyrex and Corning brand tubular gauge glasses and Macbeth brand flat gauge glasses provide good visibility over prolonged periods, and even under severe conditions.

SIGHT GLASSES: Pyrex brand sight glasses are made especially for ovens, absorption columns, reaction kettles, furnaces, pressure vessels, stills and tanks of any kind where safe, internal visibility is necessary.

OIL CUP AND LUBRICATOR GLASSES: Pyrex and Corning brand products give you visibility plus long life.

CORNING GLASS WORKS • CORNING, N. Y.
Sales Offices: New York, Chicago, San Francisco

PYREX GAUGE GLASSES
BRAND

CORNING GLASS

Sold Through Leading Mill Supply Distributors

CORNING GLASS WORKS, Dept. 03-79P, CORNING, N. Y.

We are interested in buying .....
Where is nearest source of supply?

Name .....
Company .....
Address .....
City ..... *Zone* ..... *State* .....

TECHNICAL PRODUCTS DIVISION: GAUGE GLASSES • GLASS PIPE • LIGHTINGWARE SIGNALWARE • LABORATORY GLASSWARE • OPTICAL GLASS • GLASS COMPONENTS

an operating unit, which may so overload remaining units that blower of idle unit cannot be added to bus load in advance of starting this unit (3) need for circuit breaker or fuses in addition to motor-starting equipment, these having an interrupting capacity equal to total plant generating capacity.

As shown in the diagram, for an ac plant, the motor-driven scavenging blower may be electrically connected direct to its generator. It will thus start automatically when the engine starts. To reduce delay, exciter field is energized by an auxiliary dc source, usually a storage battery of about 90 v. No circuit breaker or other control is required for the blower motor but a protective panel operates an alarm in case of motor load, or opens the generator circuit breaker and field switch if a short occurs in the blower motor or its lead.

Experiments show that sufficient scavenging air is supplied to operate an engine on fuel and build up speed after the blower motor has reached 1/6 speed. Using pilot excitation and starting on compressed air in the normal manner, blower motor begins to turn in a little over two seconds after moving engine starting lever to "start" position, and reaches 1/6 speed in less than an additional second or two. When engine is up to speed, a manual transfer switch eliminates separate dc supply and returns the exciter to the normal arrangement. In some installations, pilot excitation has been applied automatically. *ASME Paper No. 48-OGP-2.*

HYDRO POWER

Flood Control and Power in the Southwest, *by Edwin Vennard, vice-president, Middle West Service Co, Chicago, Ill.* For the dual purpose of providing flood control and power, Army Engineers are building a number of dams in the Southwest. All electric power not required for flood-control operation is turned over to the Department of the Interior for disposition. The Department, in turn, has established the Southwest Power Administration, sometimes referred to as SPA, as the agency to dispose of the power.

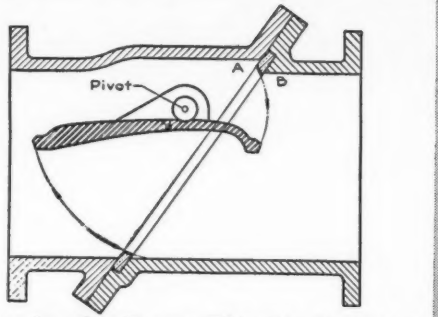
Two plans are being discussed for the disposition of the hydroelectric power for present and future generation at these government-owned and operated electric transmission systems to be used by the Southwestern Power Administration to sell government power directly to the ultimate customer.

Plan B proposes that the government power shall be sold to the electric power

Floating Disc Action Gives

CHAPMAN TILTING DISC CHECK VALVES

Quick, Quiet Closing



Cross-section of the Chapman Tilting Disc Check Valve illustrating the way that the balanced disc is supported on the pivot, with arrows showing the travel of the disc. A feature of the design is that the disc seat lifts away from the body seat when opening, and drops into contact when closing, with no sliding or wearing of the seats.

Unlike ordinary check valves, Chapman Tilting Disc Check Valves have a balanced hinged-pin disc *which works with the stream.* The disc closes quickly and quietly, with its motion cushioned by the effect of the stream against the short flap. Since there is no slamming of the disc, hammering and pipe line stresses are eliminated.

Not only does this unique valve minimize maintenance costs but it also reduces head losses 65% to 85% over conventional type check valves. When installed on pump discharge lines substantial power savings are possible.

For engineering data and test results send for bulletin.

THE **CHAPMAN** VALVE
MANUFACTURING COMPANY
INDIAN ORCHARD, MASSACHUSETTS

Zallea Expansion Joints Rate . . .

First Choice!

THE Zallea Stainless Steel Expansion Joint shown above is one of several used in the process steam distribution line of a large Western refinery . . . installed for dependable, economical operation.

In refineries, in power plants, in chemical process plants—throughout industry—Zallea Expansion Joints are rated *first choice* as the ideal medium for absorbing movement in pipe lines due to thermal changes. These features tell why more and more engineers and designers insist on Zallea when they want the best:

- *More economical than expansion bends*—the cost of insulating and installing a bend alone is frequently more than the cost of a Zallea Expansion Joint.
- *No maintenance*—having no packing they may be used in underground lines without manholes.
- *Low thrust against anchors*—require only 1/10 the force required to compress some slip type expansion joints.
- *An expansion joint for every type of service*—special types for combined axial and lateral movement.
- *Shorter face to face dimensions*—enables installation in close quarters.
- Elements may be made of stainless steels, copper, or any other metal required.
- Hydraulic method of forming assures uniform wall thickness throughout corrugations.
- As easy to install as an ordinary flanged or welding fitting.
- Traverse range from fractions of an inch up to 7½" in a single unit and 15" in a double unit.
- Pressure range from vacuum to 300 lbs. in standard units. Up to 1000 lbs. in special units.
- Temperature range from sub-zero to 1600° F.

Catalog 47 contains complete information on all Zallea Expansion Joints. We would be pleased to send you a copy. Write today! Zallea Brothers, 814 Locust Street, Wilmington 99, Del.

Zallea
EXPANSION JOINTS

WORLD'S LARGEST MANUFACTURERS OF EXPANSION JOINTS EXCLUSIVELY

companies under the stipulation that any and all savings derived by the company will be passed on to the ultimate consumer, with the government acting as the regulator.

Before outlining the relative merits of the two plans, Mr Vennard discussed:

1. Combination flood-control power dams.
2. Peaking power in the Southwest.
3. Section V of the Flood Control Act of 1944.

From his analysis of the flood-control-power problem in the Southwest, he reaches the conclusion that the public interest is best served by:

1. Let men in government attend to: (A) the development of America's rivers, including building flood-control dams where necessary. (B) regulating the electric utility business, acting as umpire to insure fair play, and to look after the public's interests.
2. Let men in business attend to running the power business under the American free-enterprise system, and under government regulation. Plan B will accomplish these objectives and guarantee that the public will realize all the benefits. *MPC Paper.*

Sediment Transportation in Streams in Relation to Power Plant Operation, *by M C Boyer, research engineer, Iowa Institute of Hydraulic Research, State University of Iowa.* For 50 years, rivers have been developed intensively for transportation of goods, flood control, irrigation, increased power and many other purposes. These developments have impressed upon man the importance of sediment and its effects upon his work. He is coming to accept the fact that future usefulness of some of the largest reservoirs he has constructed is doomed to serious impairment because sediment will inevitably fill them. To maintain certain streams for navigation, dredging and other river-channel modifications are continually required.

Sediment interferes with the operation of steam power-plant condenser-cooling systems. It deposits in the quiet waters of a forebay, in the pipes leading from the stream, or in the wet wells from which the cooling water is pumped. The sharp particles of quartz cut the blades and bearings of circulating pumps and the cooling system in regions of high velocity. It is probable that the chemical composition of the solutes in the water has a bearing on the phenomenon of dezincification.

After outlining the problems associated with sediment control, the paper discusses sediment—its nature and com-

This drawing prepared with the cooperation of Westinghouse Electric Corporation.

Hydro-Generators harness water power...with aid from oil

Here's where a lot of your electricity comes from. It's a giant hydraulic-turbine-driven generator, busy changing river power into electric power to run railroads, turn factory wheels and light cities.

See that bearing (center)! The combined weight and thrust of the rotating parts, totaling 250 tons, floats on thin films of oil between the thrust collar and the tilting shoes. If this oil fails, off might go your power, out might go your lights.

Socony-Vacuum helps assure continuous electric power production with a special Gargoyle oil for hydro-generators like this, and a Correct Lubrication program for entire power plants. The right lubricants and this complete service are available for your plant, too. Ask for it now.

Socony-Vacuum

Correct Lubrication

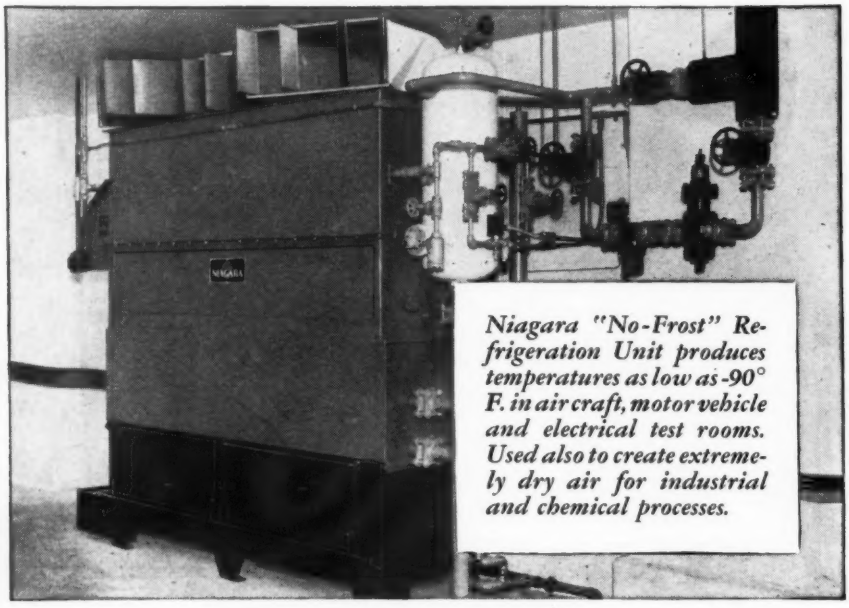
SOCONY-VACUUM

GARGOYLE

Lubricants

SOCONY-VACUUM OIL CO., INC., and Affiliates:
MAGNOLIA PETROLEUM CO., GENERAL PETROLEUM CORP.

INCREASED PRODUCTION AND A MORE UNIFORM PRODUCT WITH A *Controlled Atmosphere*



Niagara "No-Frost" Refrigeration Unit produces temperatures as low as -90° F. in air craft, motor vehicle and electrical test rooms. Used also to create extremely dry air for industrial and chemical processes.

A controlled atmosphere may be a particular gas, inert or reactive, or it may be air under controlled conditions of purity, temperature or moisture content. Its purpose is to further production or prevent loss of material or product, or to make a uniform and better product.

This Company has worked for many years among such problems and has developed special apparatus that has helped many industrial leaders to improve their manufacturing.

Always, there is a problem of moisture and temperature, whether it may be a special gas atmosphere for heat treating, or air under most precise specifications for a process with hygroscopic materials, or a "cold test" room at -90° F.

Niagara Units for industrial air and gas conditioning make it easier for you to find equipment that will produce the conditions you need with both installation and operating economy.

Write for a Niagara Blower Bulletin on a subject which interests you, or for the address of the nearest Niagara Field Engineer.

NIAGARA BLOWER COMPANY

Over 35 Years of Service in Industrial Air Engineering

405 Lexington Ave. New York 17, N. Y.

District Engineers in Principal Cities

INDUSTRIAL COOLING HEATING • DRYING

NIAGARA

HUMIDIFYING • AIR ENGINEERING EQUIPMENT

position, the way streams transport it, its effects on power-plant operation. Outlined are methods whereby to control or reduce it at steam-electric generating stations. *MPC Paper.*

STEAM POWER

Steam Power Plant Appraisal, *by Harry F Lowe, Sloan, Cook & Lowe, consulting engineers.* It is no more possible to determine the value of a power plant in terms of present-day dollars by merely referring to cost records than it is to decide on the fair selling price of a used car by finding its original cost and deducting the amount of money an owner may have set up in his personal accounts for depreciation. You have to appraise the item. Such an appraisal is "Reproduction Cost New Less Depreciation."

The first part of this term can be arrived at by using index numbers or cost-conversion factors to convert historical costs to present-day levels. Bear in mind that back in the 30's in the stress of competition certain major equipment was furnished at prices way below the average of bids from many reputable concerns. Further, much equipment, now standard today, when installed years back was still in the development stage and its old price was high because of development costs. Use of conversion factors is obviously a detailed and specialized operation.

Next part—the job of adjusting reproduction cost to existing depreciation rates—involves close study of obsolescence factors, improved efficiency, mass-production developments and other elements above and beyond operating life that set the economic life of equipment. *MPC Paper.*

Package Steam Units, *by F W Hainer, Cleaver Brooks Co.* The packaged steam generator, by the author's definition, is a self-contained assembly including boiler, boiler trim, fuel burner and various electrical controls. It fires gas or oil, and serves commercial and industrial markets for both steam heating and power generation. It is primarily a firetube design.

Annual oil consumption in this class of boilers is estimated at 30,000,000 barrels per year: 14,000,000 are No. 3 oil and 16,000,000, No. 5 and 6. For No. 3 oil this represents only 7% of the national total. Today's trend seems to point up a change in oil-burning habits. No. 3 represents no more than 15% of the total fuel oil being burned in all package steam boilers being sold. *OHI Paper.*

(*Continued on page* 174)

Complete Selection

OF YOUR FITTINGS NEEDS FROM THE LADISH *Controlled Quality* LINE

TO MARK PROGRESS

SEAMLESS WELDING FITTINGS
½"-30" STD. thru XXH

- 90° Elbows
- 45° Elbows
- 180° Return Bends
- Full Branch Tees
- Reducing Outlet Tees
- Concentric Reducers
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SEAMLESS REDUCING ELBOWS
2"x1"—6"x5" STD. & XH

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LONG WELDING NECKS

FORGED STEEL FITTINGS
Screwed & Socket Weld
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- 90° Elbows
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AVAILABLE IN CARBON, ALLOY AND STAINLESS STEELS

You can secure your entire requirements from one source by standardizing on the complete Ladish line of Seamless Welding Fittings—Forged Steel Flanges —Forged Steel Screwed and Socket Welding Fittings. Complete range of sizes . . . Carbon, Alloy and Stainless steels . . . forged to the uncompromising standards of Ladish Controlled Quality.

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SPECIFY "ALLIS-CHALMERS" FOR—

"Certified" Motor Service!

Independent Local Repair Shops Now Being Selected to Give Better, Faster Service — "Certified" Parts and Workmanship—on Allis-Chalmers Motors— Transformers — Controls — and Pumps!

THE NAME "ALLIS-CHALMERS" has always meant good motors, generously built for long life! Now you have an *added* reason for investing in Allis-Chalmers motors . . .

BETTER SERVICE

Throughout the U. S. qualified motor repair shops are being selected and authorized as Allis-Chalmers *"Certified"* Service Shops. Each will have trained personnel as well as complete facilities for servicing and repairing Allis-Chalmers motors to original factory-established standards!

"CERTIFIED" Service Benefits You These Ways:

YOU GET FINEST PARTS. *"Certified"* Service Shops use genuine Allis-Chalmers repair parts — or parts of equal quality! Each shop is given complete service information, including factory procedure and drawings, if necessary. Result: factory-like workmanship!

YOU GET FINEST SERVICE. Every Allis-Chalmers *"Certified"* Service Shop has been selected on the basis of its excellent reputation in the community. It's the kind of shop you *like* to do business with!

How To Get Allis-Chalmers "CERTIFIED" Service:

Right now most Allis-Chalmers *"Certified"* Service Shops are located in the larger U.S. industrial areas. But they're rapidly expanding. For service, call your nearby A-C District Office, or Authorized Dealer. If we do not have a Service Shop in your locality, we will recommend the one closest to you. ALLIS-CHALMERS, MILWAUKEE 1, WISCONSIN. A 2498

NEW MOTORS AVAILABLE!

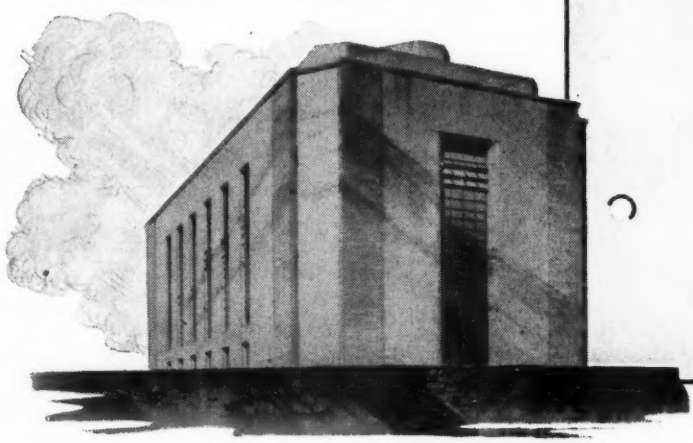
Many Sizes and Ratings of Allis-Chalmers Standard Squirrel-Cage Motors from 1 hp up are Now Available from Stock. Call Your A-C Authorized Dealer or District Office.

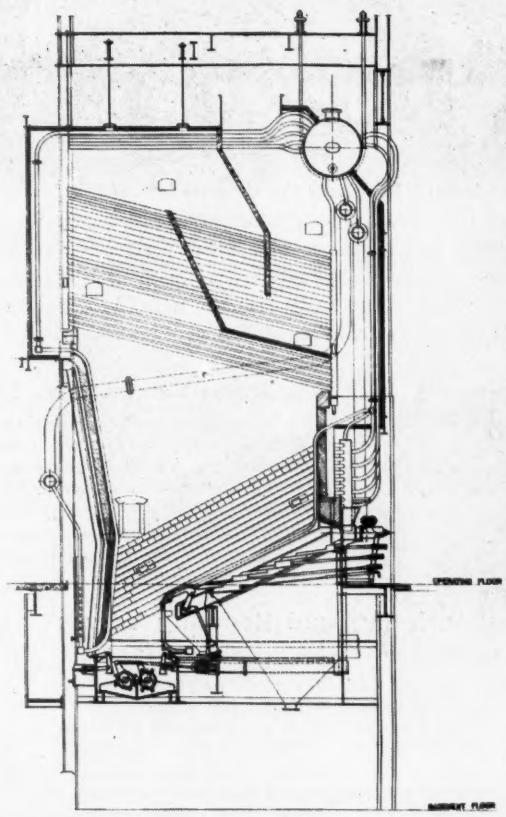
ALLIS-CHALMERS

One of the Big 3 in Electric Power Equipment—Biggest of All in Range of Industrial Products

Higher Efficiency On Lower Grade Fuels Made Available to Government Heating Plant

● *Modern heating plant in nation's capital has two water cooled Taylor Multiple Retort Underfeed Stokers. These units are designed to handle 150,000 lbs. per hour normal steam flow, and 240,000 lbs. per hour peak load. Furnishing steam heating to the Government building system, these stokers offer the ultimate in fuel flexibility.*



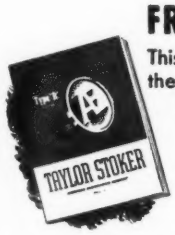


POWER PLANTS throughout coal burning areas are installing the Taylor Stokers to permit the burning of today's coals with freedom from smoke and objectionable stack discharge.

Designed with simplicity as the keynote, Taylor has lower boiler outages, fewer moving, longer wearing parts. A unique precision pusher stroke control mechanism and better air flow are two more exclusive Taylor features that aid in giving you efficient, low-cost steam generation and trouble-free operation.

Backed-up by more than 44 years of engineering "know-how," these and other distinctive advantages make Taylor the time-tested, proven, economy stoker for both original and repeat installations.

Before you decide on any fuel-firing equipment for *your* power plant, see for yourself why the "trend is toward Taylor"—it's the stoker of proven performance.



FREE

This "fact-packed" booklet on the improved Taylor Stoker.

If you aren't up-to-date on stokers, write for your copy of this descriptive booklet today!

TAYLOR STOKER

A PRODUCT OF

AMERICAN ENGINEERING COMPANY

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OTHER Æ PRODUCTS—Perfect Spread Stokers—Lo-Hed Electric Hoists & Car Pullers—Marine Deck Auxiliaries—Hele-Shaw Fluid Power

APPROVED

To the Industrial Engineer the characteristic of Stickle Equipment is *Dependability:* it does the job for which it is recommended. To the Plant Superintendent, Stickle Equipment is synonomous with *Smooth, Efficient Operation.* To the Production Manager, Stickle Equipment means *Quota at High Quality Level*—to the Plant Engineer, *Maintaining Steam Pressures with Less Firing.* To the General Manager, Stickle Equipment stands for *Production at Lower Cost.*

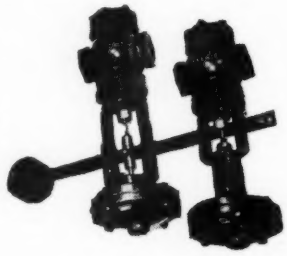
Stickle Open Float Steam Traps APPROVED—

Approved for simplicity of construction, trouble-free operation, and long service life. Stickle Open Float, basic to entire Stickle line of traps, provides natural, positive action and frees units of all levers, hinges or other complicated internal mechanism. Large capacities in proportion to size. Air and gases eliminated with condensate.

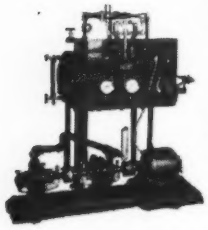
In series designs and sizes to meet requirements of specific operating conditions. Descriptive bulletins and engineering data on request. State application and working pressure.

Stickle Regulating and Reducing Valves APPROVED—

Stickle Valves are approved for complicated pressure regulation, being especially designed for use where pressure control within extremely close limits is essential. Sensitive, accurate—simple, compact. Easy to install. Renewable parts.



Self-contained valves in Single-seated, Balanced and Double-seated, Semi-balanced series, required sizes. Also Pilot-operated valves, Back-pressure valves and Float valves. Request descriptive bulletins with engineering data.



Stickle Differential Drainage and Boiler Return Systems APPROVED—

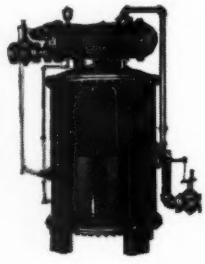
These systems are approved for plants operating steam processing units at medium to high pressures. They return condensate to boilers, under pressure, at temperatures only a few degrees lower than steam at operating temperature. Reduce steam costs, increase boiler capacity, and save pumping costs and boiler and steam line maintenance.

Systems built to meet operating requirements and conditions of specific plants. Advantages predetermined and guaranteed. Installed without interfering with plant operations. Ask for special bulletin.

Stickle Open Coil Feed Water Heaters and Purifiers APPROVED—

Approved for heating larger quantities of water to higher temperature in less space—delivering feed water to boilers at temperature within two degrees of saturated steam in heaters. Eliminate scale-forming substances and oxygen. One-sixth of total volume of boiler feed pure distilled water. Use exhaust steam for heating. Require little attention.

There is a Stickle Heater available for any industry. Capacities from 3,000-lb. single heaters to 250,000-lb. dual heaters.



Deaerating and Non-deaerating types. Cast iron or steel construction. Built standard or with extra storage space.

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Successfully Serving for More than 40 Years Paper Mills, Food Processors, Textile and Hosiery Mills, Laundries and Other Manufacturers Using Steam for Industrial Processing

STICKLE EQUIPMENT

STICKLE DIFFERENTIAL AND BOILER RETURN SYSTEMS • STICKLE OPEN FLOAT STEAM TRAPS • STICKLE REGULATING AND REDUCING VALVES • STICKLE OPEN COIL FEED WATER HEATERS AND PURIFIERS • STICKLE OIL AND STEAM SEPARATORS STICKLE TEMPERATURE CONTROLLERS AND OTHER SPECIALTIES

OPERATOR TRAINING

Training Operating Engineers, *by Garrett Burgess, National Association of Power Engineers.* An attempt to bring to the operating engineer an understanding and knowledge of fundamental power theory underlies the work of the author's organization in its training efforts for operating engineers. The feeling is expressed that men learn best from fellow engineers who are either working on or have had close contact with the same type of job. *MPC Paper.*

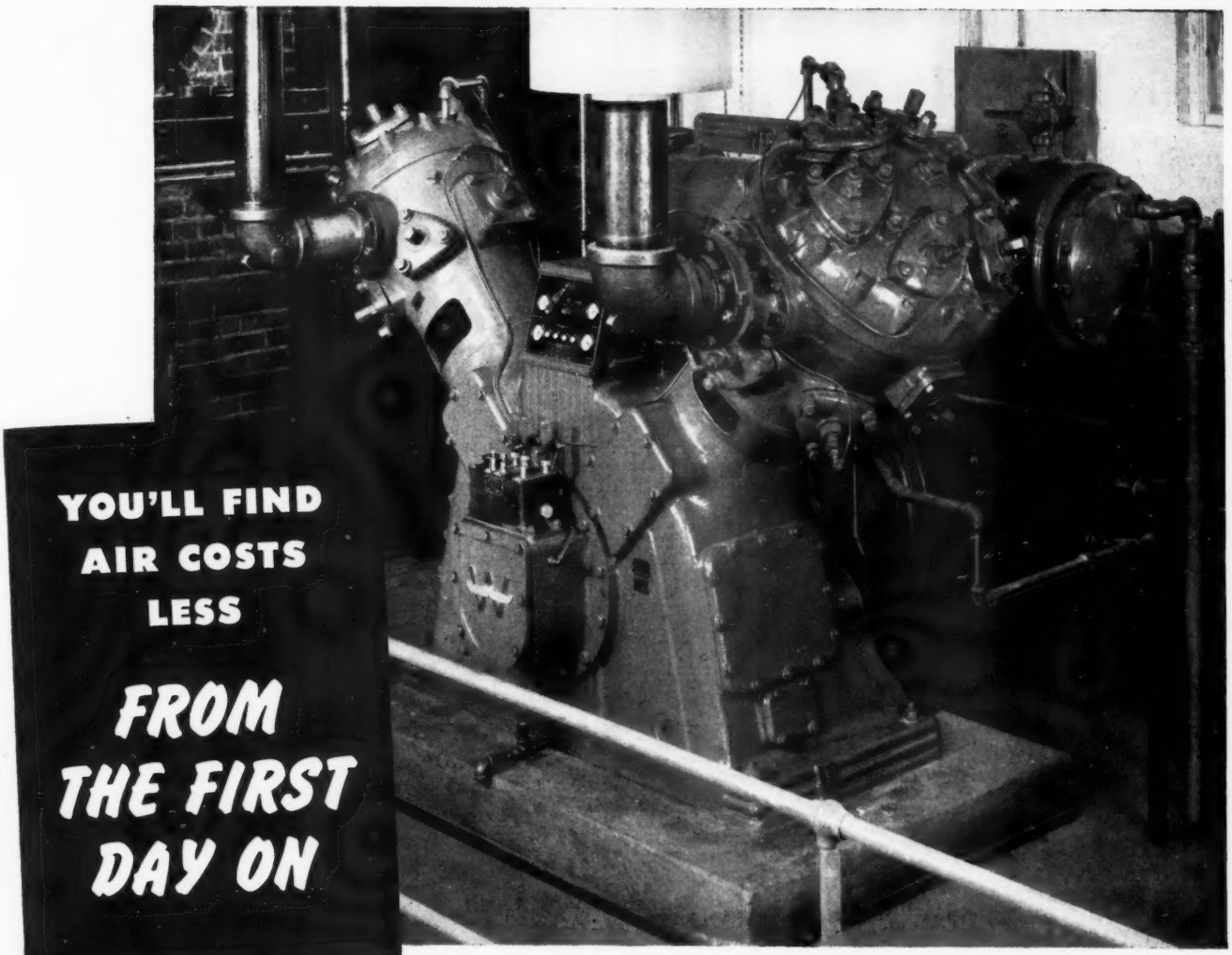
Training Power Plant Personnel, *by S O Casteel, East St. Louis, Ill.* Job training gives fundamentals to the operator, explains the objectives and invites participation in working out details. A lecture-conference method of presentation served to cover these points in one program with which the author was associated.

The returns from a good training program appear in many forms. One very evident and more or less to-be-expected result is a saving in operating costs from better use through better understanding of equipment. A secondary but every bit as important return is that a well-run training program discovers men. It points out operators capable of greater responsibilities. *MPC Paper.*

A Training Program for Custodians and Boiler Operators, *by Julius Barbour, East Lansing, Mich.* In 1935 Michigan State College issued an invitation to school superintendents, purchasing agents, custodians and operating engineers to attend a 3-day campus conference on problems and demonstrations of work practices.

A course of study grew out of this meeting. It is printed by the State Dept of Education in Michigan in Bulletin No. 2024 entitled, *A Training Course for School Custodians.* The author then described and gave details on an "on-the-job" training instituted by Michigan State College for this class of boiler operator. *MPC Paper.*

Francis Cowles Frary, director of research, Aluminum Co of America, was elected recently to receive the Gold Medal of American Society for Metals for 1948. The Gold Medal is to be presented during National Metal Congress and Exposition in Philadelphia Oct 25-29. According to W H Eisenman, national secretary of the society, the ASM Gold Medal is awarded "for outstanding metallurgical knowledge and great versatility in application of science to the metal industry, as well as exceptional ability in diagnosis and solution of diversified metallurgical problems."



YOU'LL FIND AIR COSTS LESS

FROM THE FIRST DAY ON

You save with the Worthington YC Compressor—right from the start.

It arrives completely assembled. Installation cost is low, because there's no alignment problem. No erecting engineer needed. Just make the air and power connections and it's ready for work.

You save on space, too. The YC needs only one-half the building space and one-quarter the foundation space of same-capacity horizontals.

There's more operating economy for you in the balanced Y-frame construction for higher rpm and the famous Worthington Feather* Valves—most efficient ever made.

And for years to come you'll benefit from maintenance savings. Valves are unusually accessible; openings are large for quick inspection; spare parts are smaller, less expensive. And finally, you'll always pay less for power, due to the YC's instantly responsive 3- and 5-step *variable capacity control.*

WRITE FOR DETAILS

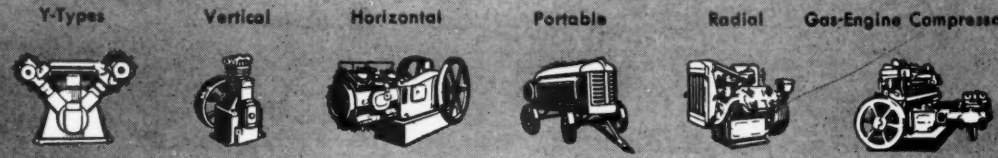
that show how Worthington YC Compressors can reduce your air costs. Bulletin L-667-B1A has the facts that prove *there's more worth in Worthington. Worthington Pump and Machinery Corporation, Compressor Division, Buffalo, New York.*

WORTHINGTON

NO OTHER COMPRESSOR WILL OUTPERFORM A WORTHINGTON

*Reg. U. S. Pat. Off.

K8-4

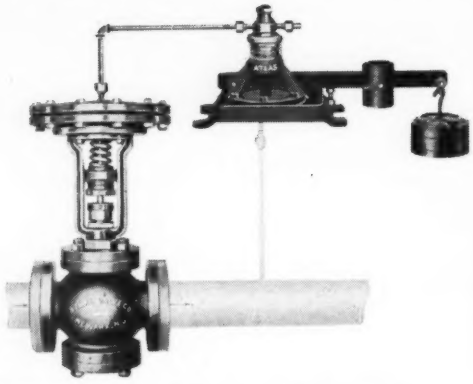


ATLAS

TRADE MARK REG

SUPER-SENSITIVE

This remarkable ATLAS Super-Sensitive Pressure Regulator—regardless of load fluctuations and pressure variations—maintains the desired pressures



RIGHT ON THE LINE

Regulates in Fractions of One Pound to Atmosphere, or Higher, in One Stage—Steam—Air—Gas.

Where Can It Be Used?

Wherever it is desired to maintain constant reduced pressure in heating mains, service mains, vats, cookers, retorts, etc. It is often used as an altitude regulator where it is desired to maintain a constant level in open tanks. Also as a pump governor where a constant delivery pressure is required. In fact its application to pressure regulation is practically unlimited. It accurately regulates at any pressure between the initial pressure and atmosphere in one stage, operating control valves from ½" to 10". Complete details are given in Bulletin 1B. Ask for a copy.

How to Order

For reduced pressures of 2 to 15 lb., specify No. 801; 0 to 5 lb., No. 801-8; 15 to 150 lb., No. 802. Sizes: ¼", ¾", 1", 1¼", 1½", 2", 2½", 3", 4", 5", 6". Some of the valves are screwed. Some are flanged.

Check These ATLAS Products

Check the items below on which you want complete data and mail to us with your name, firm name, and address.

- ☐ Super-senitive Pressure Regulators
- ☐ Other Pressure Regulators
- ☐ Damper Regulators
- ☐ Temperature Regulators
- ☐ Reducing Valves
- ☐ Exhaust Control Systems
- ☐ Pump Governors
- ☐ Oil Control Cocks
- ☐ Humidity Controllers
- ☐ CAMPBELL Boiler Feed Water Regulators
- ☐ Thermostats
- ☐ Balanced Valves
- ☐ Control Valves

ATLAS VALVE COMPANY

REGULATING VALVES FOR EVERY SERVICE

289 SOUTH ST., NEWARK 5, N. J.

Represented in Principal Cities

Plant Problems

(*Continued from page* 140)

temperature of tank water using built-in cooling coils. (3) Run a small cold-water line directly into suction line near tank exit.—**Ralph White, Cincinnati, Ohio.**

Increase Tank Height

BEST BET is to increase suction head by building up tank sides to at least double present height. After thus raising water level, he should keep it up with float control on tank supply. When *GR* states there is no way of increasing the suction head, I presume he means raising tank or lowering pump level.

A dome on top of the valve chamber would act as storage tank for any vapor generated, further reducing pump slam. —**Vincent Strojsa, Nova Scotia, Canada**

Reduce Pump Speed

SOLUTION TO *GR's* problem is simply one of reducing speed. By slowing pump to 30 or 40 strokes per min, quantity of water delivered will be equal to if not greater than that now handled.

The reasoning is simple enough. At 70 strokes per minute, piston travel is 163 fpm; piston displacement is 1204 cu in. Since the pump is a double-acting unit it will handle 2408x70, or 728 gpm. A velocity of 12 fps is needed to pass 700 gpm through 5-in. pipe. Since it is improbable that the suction water can pass through the many passages in the valve decks at this velocity, the solution is to reduce pump speed. Water velocity of 150 fpm will give him good results.—**Frank A Butler, Dallas, Texas.**

EDITOR'S NOTE: *Because of space limitations all acceptable answers to the April 1948 question were not published in the July issue. Additional answers to that question appear below.*

Step-by-Step Inspection

AFTER EXAMINING indicator cards I recommend these steps: (1) Check valves and chambers to determine if they are worn, leaking or if any foreign matter is in steam passages. (2) Examine valve gear and find if it is operating properly. Look for worn parts, poor fits and condition of springs. (3) Check eccentric setting. (4) Check dashpots, for valve failure to close properly. Finally, check indicator and its rigging.

(*Continued on page* 182)

BALANCE

You Can't Have Efficiency in Draft or Dust Collecting Equipment without it!

Balance . . . just as important in stack and dust collecting equipment as it is to a dancer. It costs needless time, money and effort, to try to get truly efficient operation from unrelated dust collecting and draft producing components obtained from different manufacturers.

Thermix packaged design flue gas control, balances and integrates the operation of: 1—dust collector, 2—fan, 3—breeching and 4—stack . . . provides predetermined efficiency . . . offers the added advantages of unit responsibility for draft production and dust collection.

These four important features of Thermix equipment, plus this unit design, unit manufacture and unit responsibility, protect your investment and assure operational savings for many years.

Details of Thermix equipment are available in a complete catalog. Write for a copy on your company letterhead.

All inquiries should be directed to:

Project & Sales Engineers

THE THERMIX CORPORATION

First National Bank Bldg. **Greenwich, Conn.**

(Offices in 28 principal cities)

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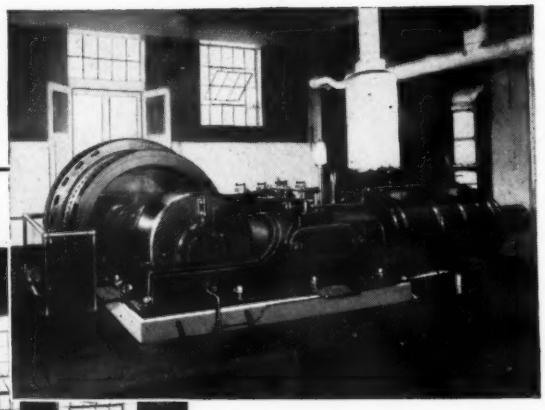
Manufacturers of Thermix Equipment

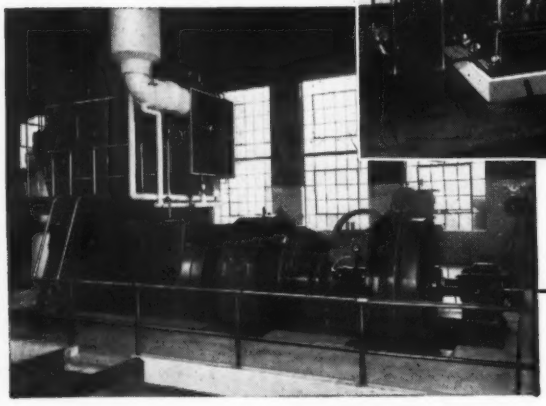
EAST PORT CHESTER, CONN.

Skinner "UNIVERSAL UNAFLOW"

The Most Economical STEAM ENGINE Built

for Generating Electric Power or Driving Compressors, Blowers, Pumps, Lineshafts . . .





300-Kilowatt Horizontal "Universal Unaflow" in Meat Packing Plant

4-Cylinder Vertical 800-Kilowatt "Universal Unaflow" in Plant of Machine Tool Manufacturer

YEAR after year the sales of Skinner "Universal Unaflow" Steam Engines continue to grow; old customers install additional units; new customers replace purchased power with power generated under their own roof, or replace other types of prime movers with "Universal Unaflow" engines.

The "Universal Unaflow" is not just another steam engine; it is the outstanding reciprocating steam prime mover of this era. The performance of thousands of "Universal Unaflow" engines, in almost every type of industry and institution, daily demonstrates the truth of our claim—that they are "the most economical steam engines built."

"Universal Unaflow" engines are correctly designed for simplicity, dependability, heavy duty service, flexibility, and permanently maintained economy. They are built for direct connection, coupling, or belt drive, to electric generators, compressors, blowers, pumps, lineshafts, or other load. They are available in sizes ranging from 75 to 3000 hp., and in horizontal or multi-cylinder vertical types.

Write us for details, and for information about the performance of "Universal Unaflow" Steam Engines in your particular type of industry.

For Over 80 Years, Doing One Thing Well—Building Steam Engines

SKINNER ENGINE COMPANY, ERIE, PA.

Power News

(*Continued from page* 156)

All available exhibition space in Grand Central Palace will be occupied by the exposition; a large percentage of it has already been placed under contract by exhibitors. A few choice locations are still open according to the management, International Exposition Co. Charles F Roth is manager, and E K Stevens associate manager.

Bureau of Reclamation Schedules Construction

▶ BUREAU OF RECLAMATION has completed scheduling of a $250,000,000 construction program for fiscal 1949. The Bureau will add only 263,000 kw to capacity of its hydro generating plants during the fiscal year ending next June 30. But it will continue work on a number of new power plants and on transmission lines.

New generating units will be put into operation this year on the Shoshone Project, Wyo. (5000 kw); at Shasta Dam, Calif. (150,000 kw); and at Grand Coulee Dam, Wash. (108,000 kw).* Work on power installations will continue at following projects:

(1) Anderson Ranch Dam, Idaho—power plant and manufacture of turbines and generators

(2) Hungry Horse Dam, Mont.—construction of dam and power plant, manufacture of turbines and generators

(3) Central Valley, Calif.—installation of last two generating units at Shasta, transmission-line and switchyard work

(4) Davis Dam, Ariz.—construction of dam, power plant, etc

(5) Hoover Dam, Nev., Ariz—manufacture of two additional generating units to supply energy for Ariz., power-plant improvements

(6) Parker Dam, Ariz.—improvement of power plant and switchyards

(7) Canyon Ferry Dam, Mont.—review of feasibility, as directed by Congress; construction of dam, if possible

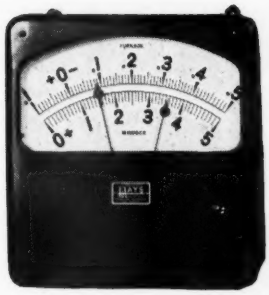
(8) Shoshone, Wyo.—work on power facilities at Heart Mountain, substantial completion of Heart Mountain power plant and switchyard

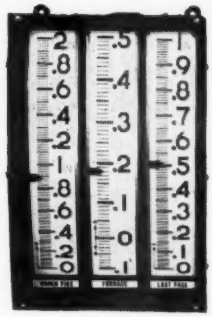
(9) Colorado-Big Thompson, Colo.—construction of Estes Park aqueduct and power system

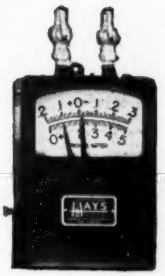
(10) Kortes Dam, Wyo.—construction of dam and power plant.

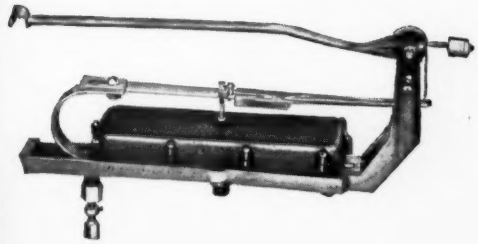
GET THE DRAFT GAGE THAT

fits your needs









● There's no sense in buying a large, expensive draft gage when a smaller one will serve quite as well, or even better; nor is it necessary to make one gage handle all drafts.

● Hays offers a comprehensive line of draft gages to meet all needs—from the small "B" gage measuring 5 by 7 inches, to the Series FOT—12 by 14 inches with a scale 10¼ inches wide.

● Vital part in all these gages is the famous Hays slack diaphragm measuring unit for pressures to 120 in. water. Above 120 in. water Bourdon Tubes are used.

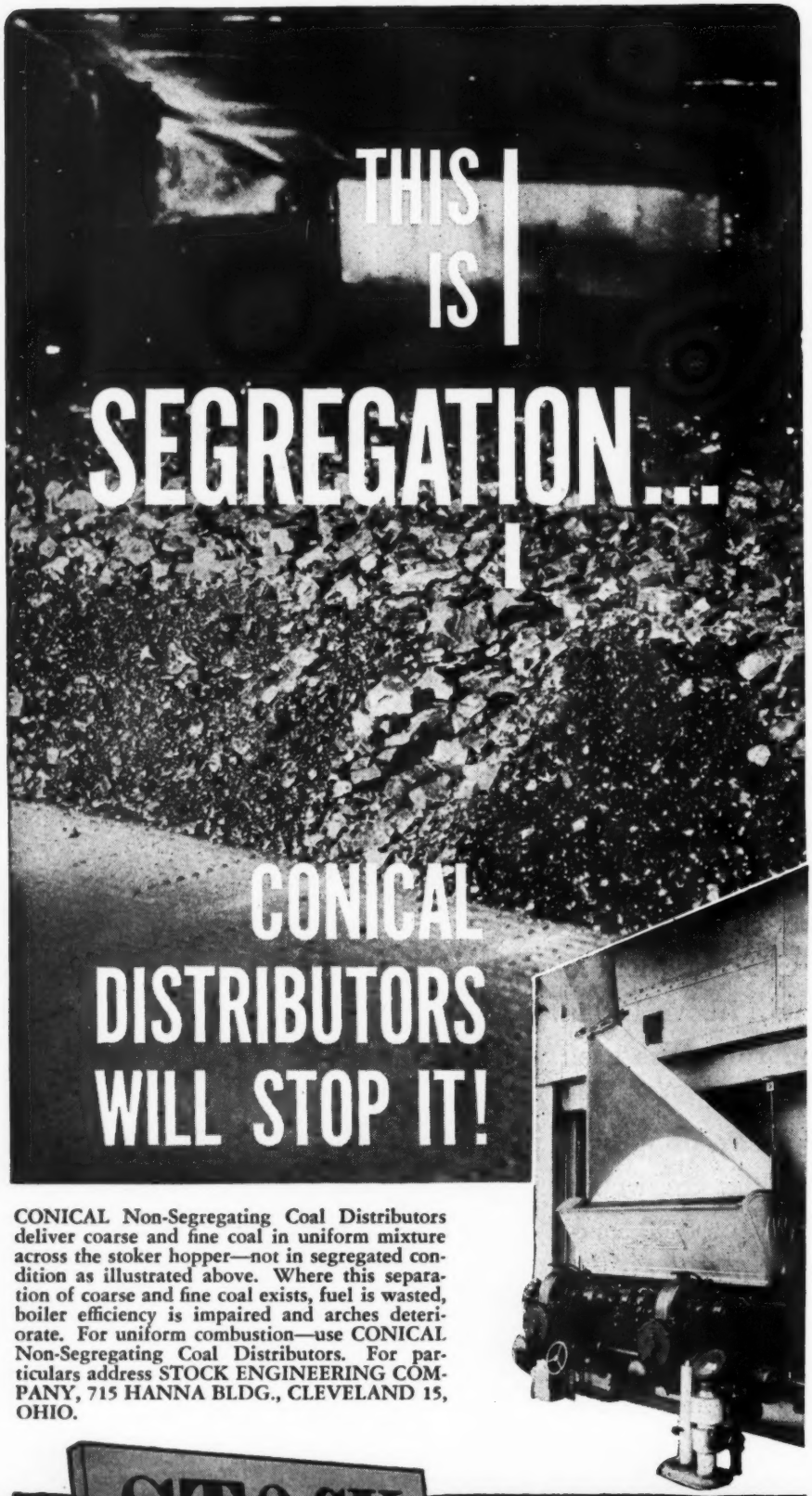
● Once it's installed, you can forget your Hays Gage. It is designed and constructed to function accurately through many years of dependable service.

● A "must" for every data file is the interesting booklet: "DRAFT—What, Where, How, Why." Glad to send it on request.

The HAYS CORPORATION

Since 1901 — COMBUSTION & INDUSTRIAL INSTRUMENTS & CONTROL

MICHIGAN CITY, INDIANA, U.S.A.



CONICAL Non-Segregating Coal Distributors deliver coarse and fine coal in uniform mixture across the stoker hopper—not in segregated condition as illustrated above. Where this separation of coarse and fine coal exists, fuel is wasted, boiler efficiency is impaired and arches deteriorate. For uniform combustion—use CONICAL Non-Segregating Coal Distributors. For particulars address STOCK ENGINEERING COMPANY, 715 HANNA BLDG., CLEVELAND 15, OHIO.

STOCK ENGINEERING CO.

★ CONICAL Non-Segregating Coal Distributors ★ S.E.CO. Coal Valves and Coal Scales

New Gas Turbine Goes Into Industrial Service

The Westinghouse 2000-hp gas turbine that recently completed more than 1000 hr of test operation (see POWER, March 1948, pp 80-82) will be shipped to Mississippi River Fuel Corp. It will drive a compressor on the natural-gas line between Monroe, La. and St. Louis, Mo.

Cooperative arrangements of Westinghouse, Mississippi River Fuel and Ingersoll-Rand have been made to run a six-month trial starting in early 1949. The gas turbine will drive a centrifugal compressor at 8750 rpm, all components of the unit being mounted on a common bedplate.

This is expected to be the first application of a mechanical-drive power gas turbine in industry in the U. S. A. The unit will require only a simple, inexpensive concrete mat foundation and can be trucked into remote undeveloped regions. Needing little lubricating oil and no water the unit can be set up and made ready to operate in a few hours.

In addition to this application, Westinghouse has plans for building a gas-turbine powered locomotive.

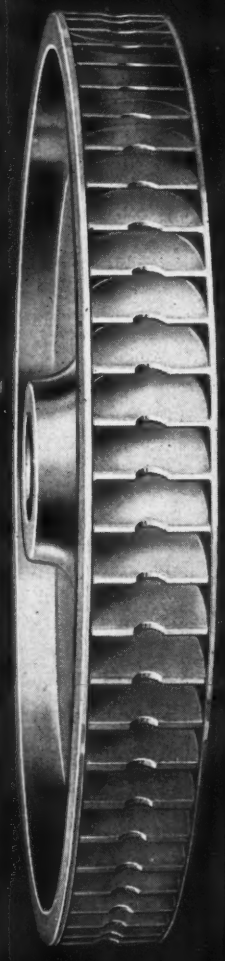
Bureau of Mines expects to start construction this fall on the $750,000 lignite research laboratory at Grand Forks, N. D. Completion of the research center is scheduled for the end of 1949. Representing the culmination of many years of cooperative research in lignite between Bureau of Mines and University of North Dakota, the new laboratory will be the only one in the U. S. devoted exclusively to research on lignite. Congress appropriated $200,000 in cash for the project and approved contract authorizations for $550,000. The reseach center's basic facilities will include a laboratory for small-scale research, a general service section for supplies and a machinery bay suitable for large-scale pilot plant research.

Johnson Service Co, Milwaukee, has recently conducted a training school for technicians and apprentice mechanics from branch offices and June graduates in mechanical engineering from various colleges. Under direction of J R Vernon, sales promotion manager, the course, which continued through Aug 13, was divided into three sections: automatic control apparatus, under H W Alyea, field and development engineer; heating and air-conditioning systems, under M M Herrick, application engineer; and sales and contracting operations (for those in sales activities only) under J R Vernon.

Lincoln Electric Co, of Cleveland Ohio, manufacturer of arc-welding equipment, is now authorizing outstanding service and repair organizations in all the principal industrial centers of the U. S. to be field service shops for Lincoln equipment. The shops are making available immediately Lincoln factory parts and factory service.

Harry W Smith Inc, technical publicity and editorial relations, has moved to 507 Fifth Ave, Room 1101, New York 17, N. Y.

TERRY



BLADE PROTECTION

Made Possible by Nozzle Location

In the Terry Solid-Wheel Turbine, the steam enters the buckets from the top, not from the side of the wheel, as shown in the illustration above. This permits a one inch clearance on either side of the wheel. In addition, projecting rims on each side of the buckets prevent damage to the blades even though excessive thrust should tend to move the shaft.

This feature and others, as important, are described in detail in Bulletin S 116 which will be sent to you on request.

T-1175

THE TERRY STEAM TURBINE COMPANY
TERRY SQUARE, HARTFORD, CONN.

DARTS FIT TIGHT

because of the **GROUND BALL JOINT**

A TRUE BALL JOINT Spherical grinding finishes the seats of a Dart into a true ball joint with wide, true-bearing surfaces. Because of this feature, Darts are easily made tight without jamming . . . without damage to seats.

TWO BRONZE SEATS The special bronze alloy used for Dart seats has a high resistance to pitting, electrolysis and corrosion . . . means years of leakproof protection.

PRACTICALLY INDESTRUCTIBLE Both body and nut of a Dart are made of high-quality, air-refined malleable iron to give extra resistance to stress and stretching . . . extra years of life under toughest conditions.

EXTRA-HEAVY SHOULDERS And lastly, to withstand more years of wrench abuse, the shoulders of a Dart union are made stronger and heavier.

When you add up these features it is easy to see why Darts can be used again and again . . . why Darts will bring you more years of trouble-free service.

E. M. DART MANUFACTURING CO.
PROVIDENCE 5, RHODE ISLAND

DART UNIONS

When you add up these features it is easy to see why your customers will be happier . . . your profits greater . . . when you sell sturdy Dart unions.

(*Continued from page* 176)

AJS should not overlook the possibility of the piston striking cylinder head. Some years back an air compressor in our plant operated very quietly a few minutes after starting up and then developed a metallic thump. The piston had been replaced some years previously and the new piston was thicker than the one supplied by the manufacturer. As a result the clearance volume was reduced. By removing a valve at each end and inserting a piece of lead wire so it would be flattened between piston and cylinder head, clearance space was checked. The piston rod was turned in the crosshead nut until clearances were the same at both ends of stroke, then the locknut on the rod was tightened.—**Howard T Livingston, Los Angeles, Calif.**

Procedure for Adjusting Valves

FROM INDICATOR CARDS shown, the engine needs valve adjustment. All events are late and, in addition, no compression is indicated in either cylinder.

Valves in both cylinders should be checked for wear or other defects. Starting with high-pressure side, wristplate should be set in midposition or line on line. These lines will be found on wristplate hub and stand. Steam valves with wristplate in this position should be lapped about 5/16 to 3/8 in. The exhaust valves should be set line on line, or negative lap. Place high-pressure side crank on top dead center, and give steam valve approximately 3/16 in. lead by rolling eccentric around shaft in direction of engine rotation. Crank should be set on bottom dead center. Give steam valve more lead, about ¼ in. for trial. Low-pressure side should be checked in the same way, allowing approximately 1/32 to 1/16 in. to lap and lead.

On taking indicator cards, if admission is late, advance eccentric to obtain proper point; if compression increases to an excessive amount with proper admission, reduce lap on exhaust valves by adjusting exhaust valve rods at wristplate.

AJS can solve his problem by following procedure outlined. I recommend checking with manufacturer as to exact lap and lead for engines of this type and size.—**F R Haworth, Arlington, Mass.**

Do Steam Valves Leak?

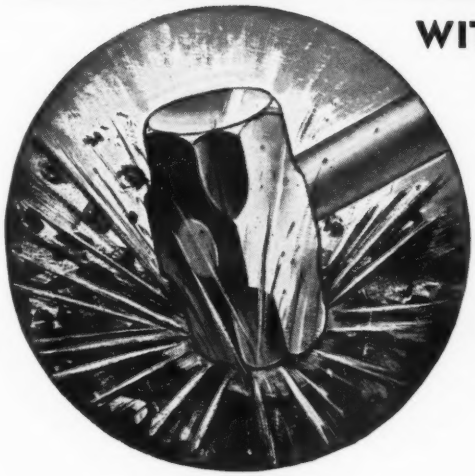
I AGREE WITH *AJS* that valves need adjustment. Release and compression take place too late, causing engine to pound on centers. Release end of dia-

(*Continued on page* 214)

Better Coal Preparation for Greater Combustion Efficiency

WITH

AMERICAN SHREDDER RING CRUSHERS

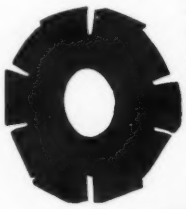


= RAGGED FIRE BED
= EXCESSIVE CO_2
= ASH PIT LOSS

= EVEN FIRE BED
= UNIFORM COMBUSTION

Every pound of coal means *more* BTU's—more efficient heat, when Americans do the preparation job! ROM coal is reduced rapidly with exacting control of fines, uniform sizing and no oversize—at a cost of less than 1¢ a ton. The result: Americans pave the way for a loose, uniform firebed quickly responsive to sudden steam demands—without excessive ashpit drop or unnecessary CO_2.

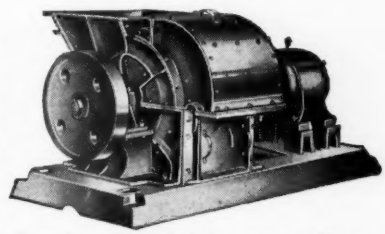
Shredder Ring



Patented manganese steel shredder rings, exclusive with American Rolling Ring Crushers, *split the coal* by impact rather than by crushing. Shown below is the rotor assembly, with its many rows of shredder rings. Each ring has twenty cutting edges — and revolves on individual shaft, free to deflect from tramp iron without damage.

Rotor Assembly

American Type "S" Rolling Ring Crusher, with heavy cast steel housing and sectional construction, secured at dust-tight machined joints with coupling bolts for easy access to crushing chamber.



Write for details on efficiency of coal preparation in power plants with American Crushers.

American PULVERIZER COMPANY

Originators and Manufacturers of Ring Crushers and Pulverizers

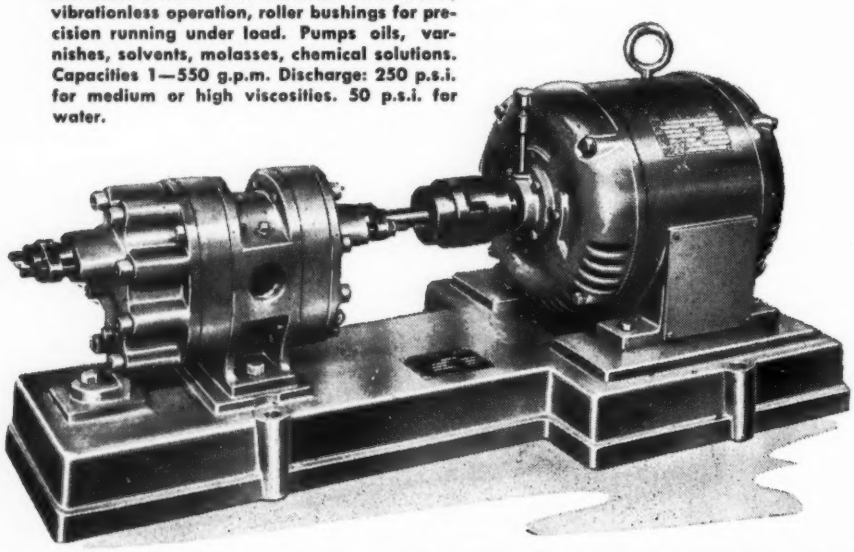
1349 MACKLIND AVE.
ST. LOUIS 10, MO.

If down-time is a headache specify SIER-BATH GEAREX PUMPS

THE design and construction of Sier-Bath Gearex Pumps have been planned to insure continuous service and to avoid shut-downs. Manufacturing pumps of the utmost durability comes naturally to this Company, for Sier-Bath has been famous for many years as a manufacturer of precision gears. Gearex pumps are made under the same high standards that have been inherent in this shop in the making of fine, accurate gears.

Gearex Pumps are long-lived positive displacement units, discharging liquids without pulse or vibration. Double helical pumping rotors and discharge passages of proper area to insure continuous overlapping displacement of liquids are a feature of the Sier-Bath Gearex Pump. Since the rotors are not in contact, there is very little wear. The rotors are keyed to shafts and carefully timed through heat treated steel timing gears, keyed and locked on the ends of the shafts. These are only a few of the fine points of construction in these high quality pumps. Send for booklet.

SIER-BATH GEAREX PUMP Balanced axial thrust, vibrationless operation, roller bushings for precision running under load. Pumps oils, varnishes, solvents, molasses, chemical solutions. Capacities 1—550 g.p.m. Discharge: 250 p.s.i. for medium or high viscosities. 50 p.s.i. for water.



For Higher Pressures and Capacities, Use SIER-BATH SCREW PUMPS

ALSO MAKERS OF SIER-BATH PRECISION GEARS

FOUNDED 1905 **MEMBER A. G. M. A.**

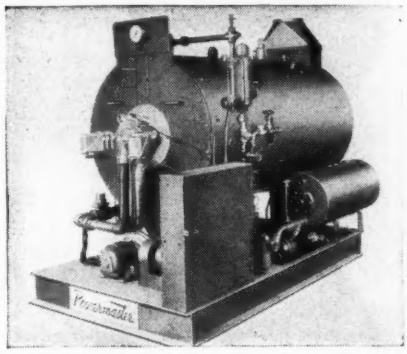
Sier-Bath GEAR and PUMP CO., Inc.

9254 HUDSON BOULEVARD • NORTH BERGEN, NEW JERSEY

New Equipment

(*Continued from page* 160)

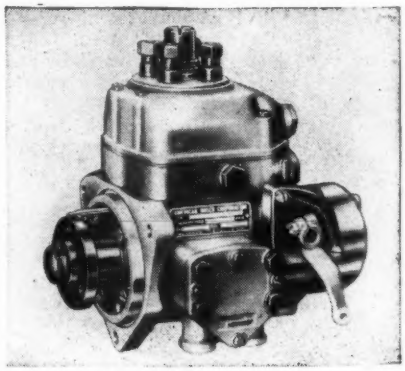
put shaft that rotates at a rate equal to one half the distance in speed of the two motors. When speeds of the two motors become equalized, output shaft of the unit is stationary. The units operate from a 3-phase source over a frequency range of 15 to 60 cycles per sec, with an input voltage of 0.007 times the frequency in cycles per min. They are also available in similar units wound for high voltages and single- or 2-phase operation. **Kollsman Instrument Div, Square D Co, 80-08 - 45th Ave, Elmhurst, N. Y.**



Three-Fuel Boiler E366

SAME BURNER handles light oil, heavy oil or gas with changeover from one fuel to another within a period of ten min, claims its manufacturer. *Powermaster* ranges in size from 525 to 7000 lb per hr of steaming capacity with fully automatic operation.

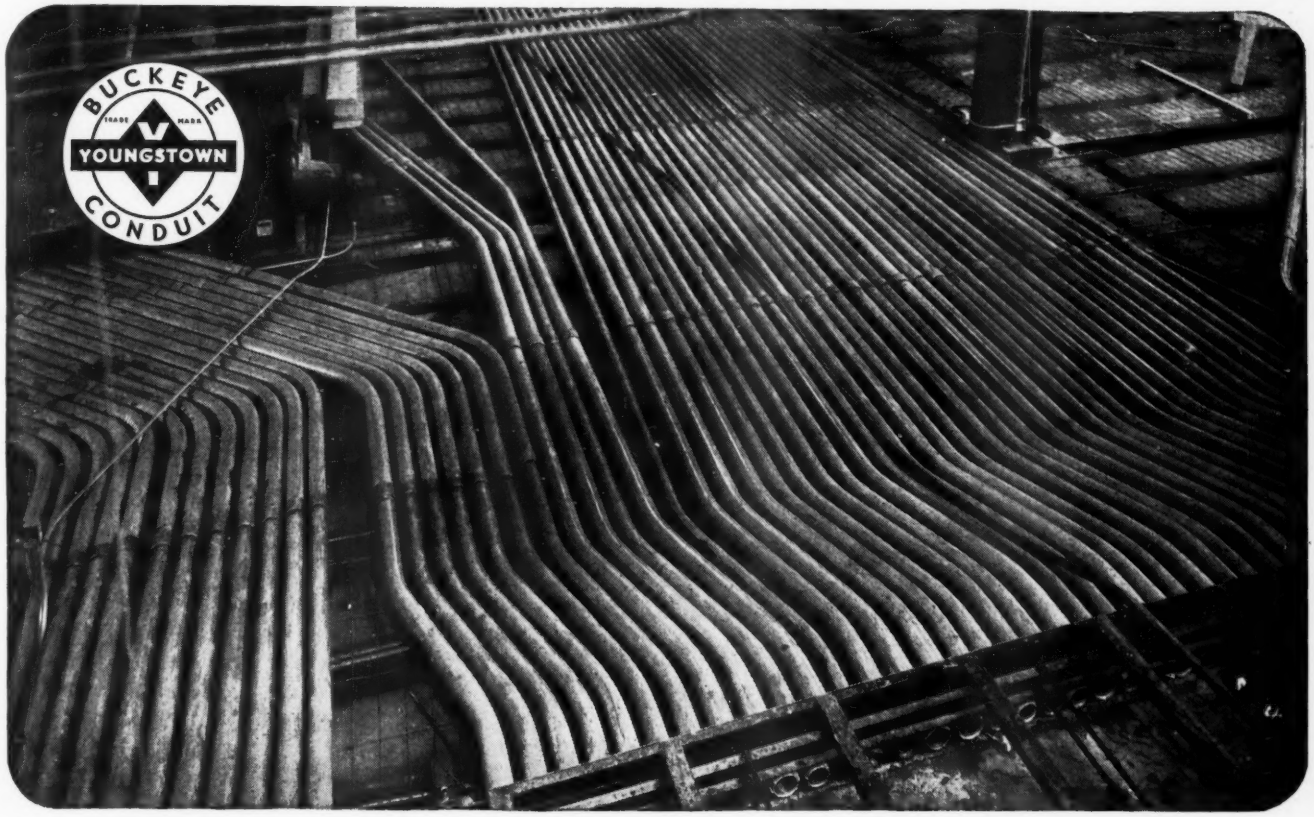
Among the leading advantages are (1) modulated control of flame volume to maintain steam pressure with changes in steam demand (2) free-swinging rear cover that makes tube cleaning quickly possible (3) an air-atomizing burner (4) flame-failure safety features. **Orr & Sembower, Inc, Reading, Pa.**



Fuel-Injection Pump E367

SINGLE-PLUNGER TYPE *PSA* fuel-injection pump, characterized by simplicity and low cost, is being produced initially in a size primarily suitable for small diesels. Built to same high standards of precision as

FOR SAFETY'S SAKE . . . USE CONDUIT *(Full Weight Rigid Steel)*



When you say "BUCKEYE CONDUIT"

you're talking Wiring Safety

FOR many years Youngstown "Buckeye" has been the most widely used rigid steel conduit in the world. It is a standard-threaded, heavy wall conduit, properly finished inside and out for maximum wiring protection and efficient installation and service. In every respect it meets the rigid requirements of the industry, as expressed in the National Electrical Code. More than a quarter century of service under the most severe conditions has demonstrated that it is thoroughly dependable.

So specify and install Youngstown "Buckeye" wherever you want positive wiring safety. It is now available through leading distributors in every industrial market. For their names and for other information on conduit, write, phone or wire our nearest District Office.

Ask your distributor for:
Youngstown Buckeye Conduit...Pipe and Tubular Products...Sheets...Plates...Electrolytic Tin Plate...Coke Tin Plate...Bars...Rods...Wire...Tie Plates and Spikes.

YOUNGSTOWN
THE YOUNGSTOWN SHEET AND TUBE COMPANY
GENERAL OFFICES - YOUNGSTOWN 1, OHIO
Export Offices - 500 Fifth Avenue, New York City
Manufacturers of
CARBON - ALLOY AND YOLOY STEELS

Only AIR EXPRESS gives you all these advantages

A combination you don't get with other air-shipping methods

1. Special pick-up and delivery *at no extra cost.* Your shipments are picked up promptly when you call; fast delivery to consignee's door.

2. *You get a receipt for every shipment.* One-carrier responsibility. Complete security.

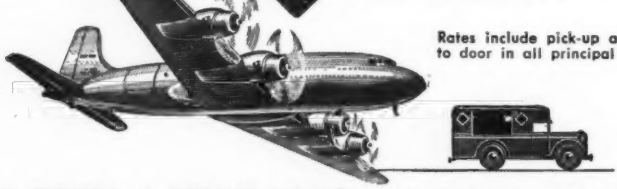
3. Assured protection, too—free valuation coverage up to $50; 10 cents for each additional $100 or fractional part.

These advantages, plus 21 others, make Air Express the best and fastest way to ship. Your shipments go on every flight of the Scheduled Airlines—repair parts, equipment, finished items *keep moving* to where they're needed. Reach any U.S. point in hours. Phone local Air Express Division, Railway Express Agency, for fast shipping action. Specify "Air Express" on orders for quickest delivery.

FACTS on low Air Express rates

22 lbs. machine parts goes 700 miles for $4.73.
10 lbs. printed matter goes 1000 miles for $3.31.
30-lb. carton of new fashions goes 500 miles for $4.61.
Same day delivery in all these cases if you *ship early.*

SPECIFY AIR EXPRESS
AIR EXPRESS
GETS THERE FIRST

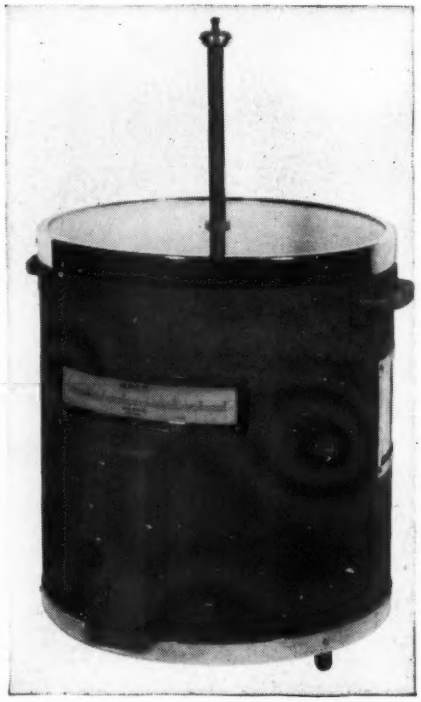


Rates include pick-up and delivery door to door in all principal towns and cities

AIR EXPRESS, A SERVICE OF RAILWAY EXPRESS AGENCY AND THE
SCHEDULED AIRLINES OF THE U.S.

earlier types, low cost of *PSA* pump is inherent in its design, which is very simple, requiring many fewer parts. A single plunger and delivery valve do work formerly allocated to four or six plungers and delivery valves. It is of cam-operated constant-stroke, throttled-intake type. Single plunger has a continuous rotary motion in addition to its reciprocating motion and serves as its own fuel distributor. Although a multi-outlet unit, it has only a single delivery valve.

The *PSA* is equipped with a positive-displacement gear-type fuel-supply pump and a variable-speed governor of the mechanical centrifugal type driven directly from camshaft without gearing. Present production includes both 4- and 6-cylinder types. Another series, of larger capacity, has been developed for later production. The present unit, designated *PSA. . A,* is designed for normally aspirated 4-cycle engines up to about 80 cu in. piston displacement or for fuel quantities up to about 90 cu mm per stroke. **American Bosch Corp, Springfield 7, Mass.**

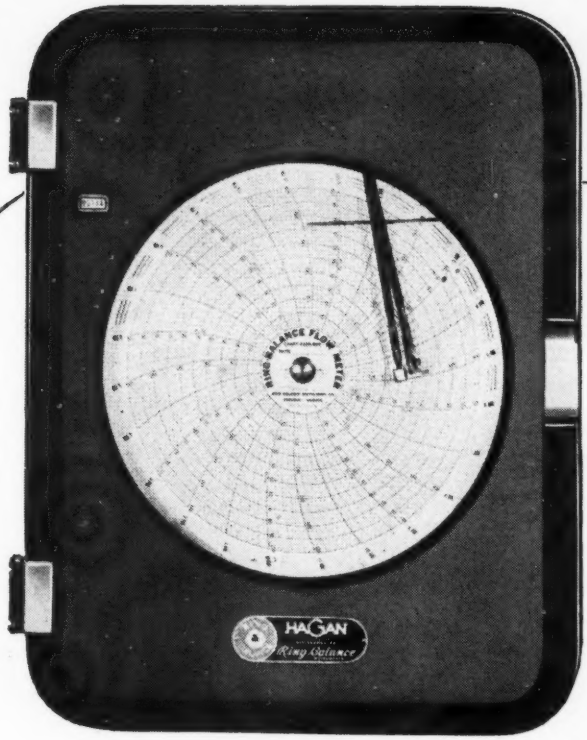


Electrostatic Voltmeter E368

AVAILABLE IN FIVE RATINGS, 40, 50, 60, 70 and 75 kv, this new portable electrostatic voltmeter is designed to meet the needs for a high-impedance, high-voltage instrument in laboratory and industrial testing.

Instrument may be used to measure applied voltage during dielectric tests, to study electric phenomena, and to determine peak voltage by the vacuum-tube method. Housed in a cylindrical steel case 21½-in. in diameter, it weighs about 50 lb. The high-voltage connector projects about 12 in. above top of 35-in. high case.

Moving system consists of two fixed electrodes between two small metal spheres that rotate on a pivoted shaft on which are mounted aluminum damping vanes, a mirror and a spring. The mirror reflects a light beam into the scale, indicating posi-



Boiler Meters By HAGAN

The accuracy and dependability of Hagan Ring Balance Flow Meters make them especially suitable for boiler plant applications, either as a guide in the operation of manual combustion control systems or a check on the operation of automatic systems.

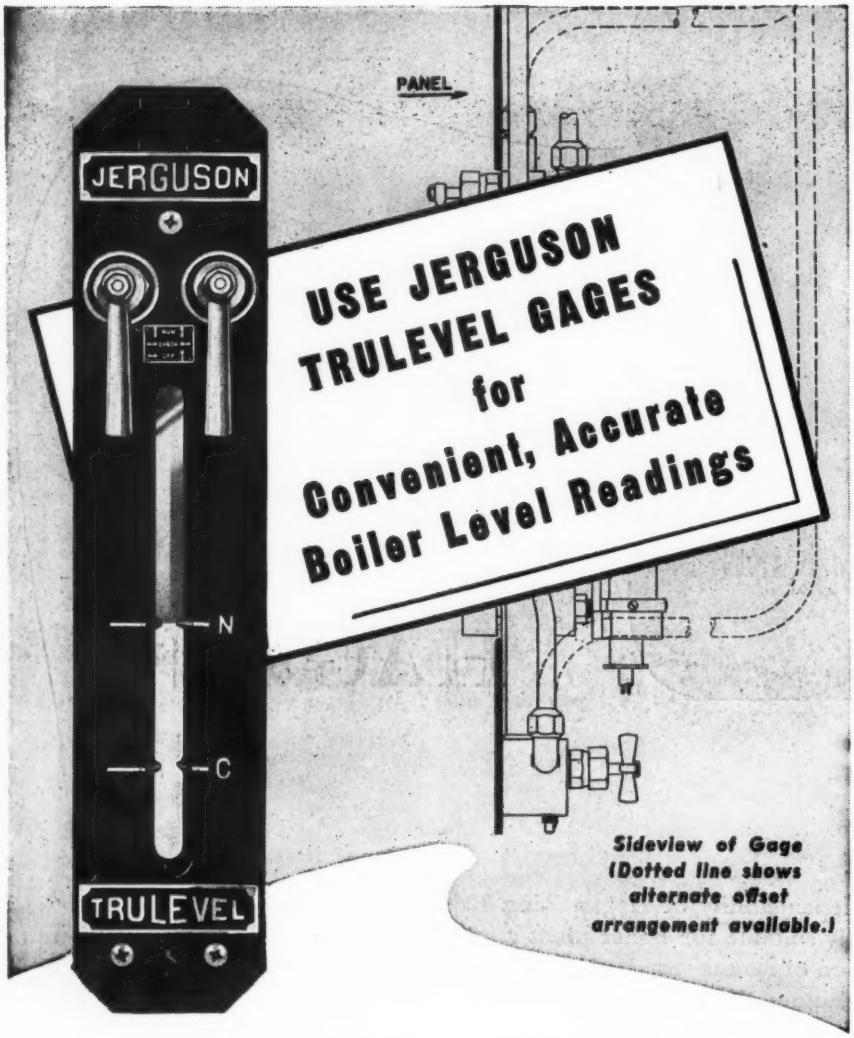
Meters are available for virtually any type of flow measuring application. Among the most widely used types, however, is the boiler meter shown here which records both steam flow and air flow on the same chart. This meter is so designed that auxiliary records of flue gas temperature, feedwater temperature or steam pressure may be added if desired.

For full information on Hagan Ring Balance Flow Meters, write for Hagan Bulletin 2M48. Hagan Corporation, Hagan Building, Pittsburgh 30, Pennsylvania.

HAGAN CORPORATION

HAGAN
HALL
BUROMIN
CALGON

BOILER COMBUSTION CONTROL SYSTEMS
RING BALANCE FLOW AND PRESSURE INSTRUMENTS
METALLURGICAL FURNACE CONTROL SYSTEMS
THRUSTORQ FORCE MEASURING DEVICES



HERE is a gage that gives you . . . at eye level . . . a positive reading of the height of the water in your boiler. The Jerguson Trulevel Gage is located down where you can see it, at the point most convenient for you. Wall or panel mounted.

And Jerguson adds dead sure accuracy to convenience, through precision engineering. Jerguson Trulevel Gages are provided with a new datum column which is fully steam jacketed, duplicating the temperature and specific gravity conditions which exist in the boiler drum. This guarantees *correct readings.*

Jerguson Trulevel Gages are of stainless steel construction for lifetime service. Made in three standard sizes to accommodate all pressures.

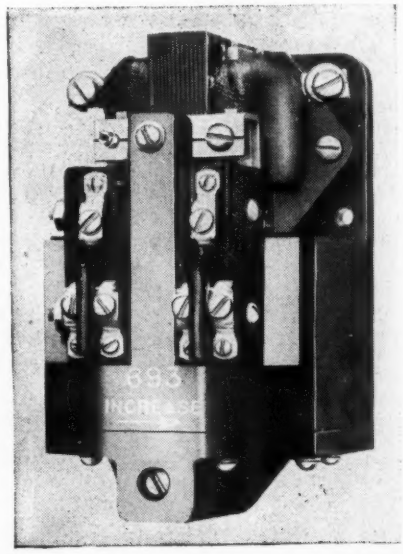
Write for
Engineering Data Unit

Note These Important Additional Features:

1. Jerguson Trulevel Gage is back illuminated, easy to read. Water level stands out sharply.
2. New checking device incorporated in unit. Positive checking in matter of seconds.

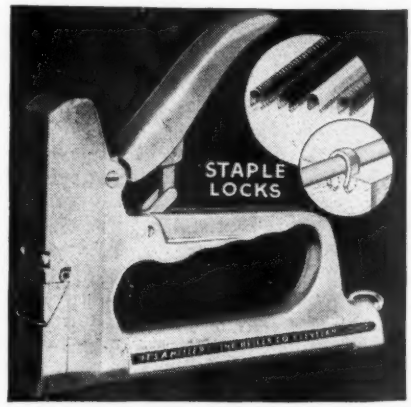
JERGUSON
GAGE & VALVE COMPANY
100 Fellsway • Somerville 45, Mass.
Representatives in Major Cities . . . Phone Listed Under JERGUSON

tion of moving electrode. Minimum number of insulating supports are used between moving system and case, resulting in high insulation resistance. Top insulating plate upon which resistor housing is mounted is made of *Plexiglass* to allow inspection of moving elements. **General Electric Co, Schenectady 5, N. Y.**



Pneumatic Timer E369

AC PNEUMATIC TIMER is designed for a variety of control timing needs such as conveyor and automatic processing equipment. Timer requires only small space, $2\frac{3}{4}$x$4\frac{7}{8}$ in. Eight turns of timing screw with a screw driver gives a range of 0.3 sec. to 3 min time. Reset is practically instantaneous. Timer is available in either one or two timing steps. The 2-step design eliminates need for one timing relay. **Cutler-Hammer, Inc, 294 N 12th St, Milwaukee 1, Wis.**



Wire Stapling Gun E370

HAND TOOL automatically staples braided, rubber-covered, single and duplex wire to baseboards, plaster walls, window frames, etc. Automatic stapling gun has a controlled power chamber to meet any predetermined drive without marring or injuring the wire. Rustproof staples are available in any desired color.

The staple drives in hard or soft wood,

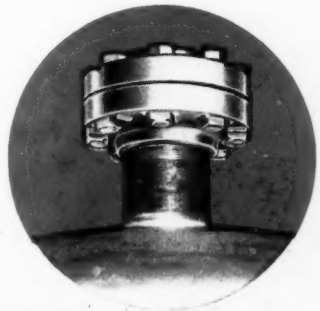
(*Continued on page* 192)

THEY SAVED $75
...then footed a bill for $23,000*!

Rampant over-pressure causes pressure rupture. Such "explosions" wreck, burn, kill and maim. Buildings and equipment are destroyed. Shut-downs anger customers. Hard-gained profits disappear.

Are your plant and equipment really safe from such losses? Check with your Plant Engineer today about installing Black, Sivalls & Bryson SAFETY HEADS. A SAFETY HEAD is a positive pressure fuse. It gives instant relief when over-pressure threatens. *In 100,000 plants where BS&B SAFETY HEADS are used, no pressure vessel protected by a SAFETY HEAD has ever exploded!*

Write or wire today for full information. Address Industrial Power Department, Black, Sivalls & Bryson, Inc., 27th Floor, Power and Light Building, Kansas City 6, Missouri.



*Explosion damage amounted to $23,000. A BS&B SAFETY HEAD, costing as little as $75 would have relieved the excessive over-pressure in the oil and gas separator which exploded. The illustration is an artist's drawing of the resulting devastation.

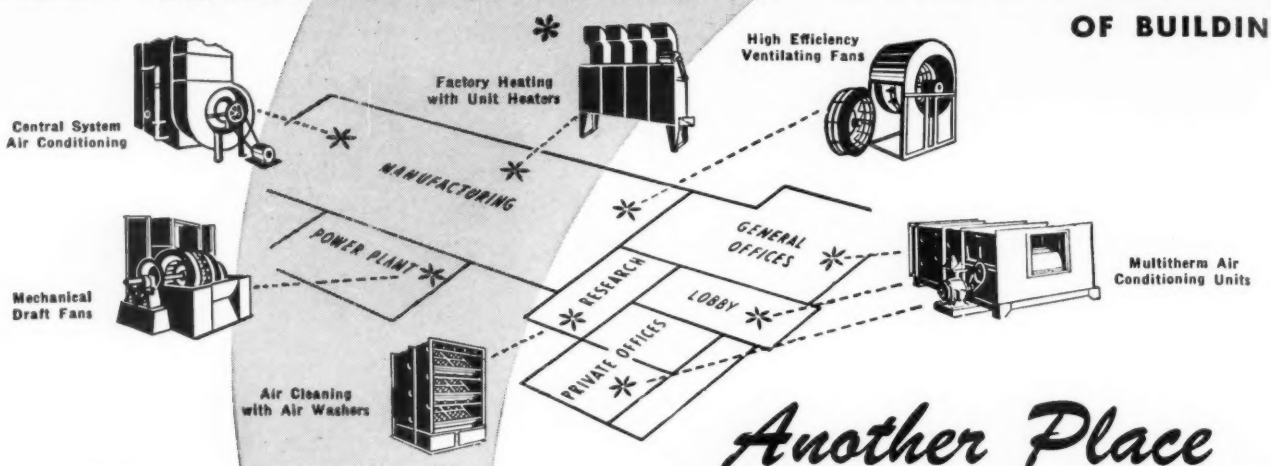
EFFICIENCY RELIABILITY

FOREIGN INQUIRIES INVITED Cable Address: BLACK, KANSAS CITY, U.S.A.

BLACK, SIVALLS & BRYSON, INC.

KANSAS CITY, MO. OKLAHOMA CITY, OKLA.

THERE'S CLARAGE EQUIPMENT FOR EVERY NEED IN EVERY TYPE OF BUILDING



Another Place

CLARAGE

Saves You Money

IS IN

FACTORY HEATING

NOT as much fuel required with Clarage Unitherm Unit Heaters . . . the reason, SYNCROTHERM CONTROL.

Here's a patented device, obtainable ONLY on Clarage Unitherms, which controls temperatures by regulating the amounts of return air passing through and/or around the heating coil.

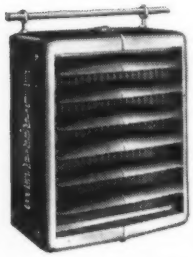
A constant circulation of heated air is maintained — *no stratification; no hot ceilings; no cold floors.*

And since uniform, effective heating is accomplished with LOWER temperature air, *operating economies are substantial.*

If you have any type of industrial heating problem, Clarage Unitherm Unit heaters — and SYNCROTHERM CONTROL — merit your investigation.

Unitherms are also built in the SUSPENDED TYPE— to save floor space — installed either along the walls or at the ceiling.

UNITHERM HEATER FLOOR TYPE



CLARCO HEATERS

Unitherm Unit Heaters

also have other highly desirable features. Note V-belt drive insuring quieter operation, wide flexibility of output. Note that outlets are square, permitting 4-way adjustment of heat flow. What you can't see are the positive, centrifugal fans which spread heat evenly over wide areas; that every working part is easily accessible by removing either front or back of casing.

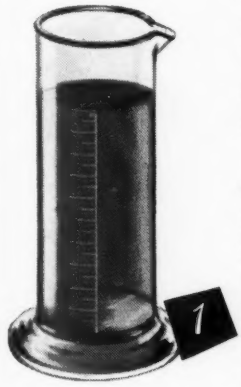
CLARCO HEATERS are for smaller heating jobs, and to "help out" present equipment. Both Unitherm and Clarco Heaters are available in a wide range of sizes, operating either on steam or hot water.

CLARAGE FAN COMPANY

KALAMAZOO, MICHIGAN . . . SALES APPLICATION OFFICES IN ALL PRINCIPAL CITIES

GULFCREST is the only turbine oil refined by the Alchlor Process*

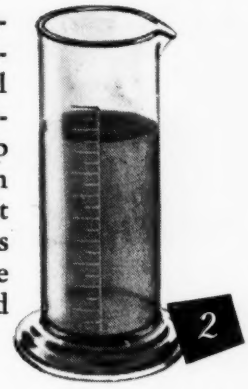
. . . an extra step that removes this 15%

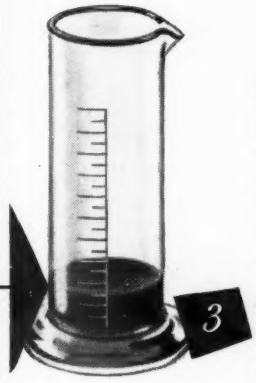


Gulfcrest is the only turbine oil that's Alchlor-processed.* This is an extra refining step. It makes Gulfcrest extra pure and extra efficient.

In Cylinder 1 you see the oil that will become Gulfcrest. It has already gone through the usual steps used in refining other turbine oils — but has not yet been Alchlor-processed.*

In Cylinder 2 you see the finished Gulfcrest—the incomparably pure lubricating oil that gives outstanding performance and helps keep steam turbine systems clean indefinitely. To make it even finer, special inhibitors are added to it — they give it even greater stability and protect against corrosion.





In Cylinder 3 you see the part—approximately 15%—discarded by the Alchlor Process.* This is the part that, when allowed to remain in turbine oil, is most likely to oxidize, increase neutralization number, and form sludge, emulsifiers, and harmful acids.

Call in a Gulf Lubrication Engineer today and ask him to recommend the proper grade of Gulfcrest Oil to meet the specific requirements of your turbines. Write, wire, or phone your nearest Gulf office.

GULF INDUSTRIAL LUBRICATION

Gulf Oil Corporation · Gulf Refining Company

Division Sales Offices:

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3800 Gulf Building, Pittsburgh 30, Pa.

Please send me, without obligation, a copy of your new booklet "Gulfcrest Oil for Steam Turbine Lubrication."

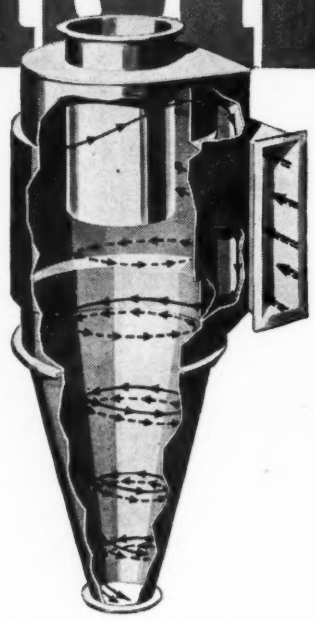
Name.....

Company.....

Title.....

Address.....

What to do about fly-ash COLLECTION



Dollars to doughnuts

your attitude on dust collection and recovery is "Show me!" Because the Buell van Tongeren high-efficiency cyclone is so different its promise of better service on your job is important. *First*, only the van Tongeren System has the "Shave-off", which is the pay-off in achieving high fractional efficiencies. *Second*, each Buell unit is engineered to the job for which it is to be built. *Third*, size, shape and proportion give it not only a decided efficiency advantage but an assured freedom from plugging which is most important. The facts are marshalled for easy reading in a new 32 page catalog. Write to: **Buell Engineering Company, 10 Cedar Street, New York 5, N. Y.**

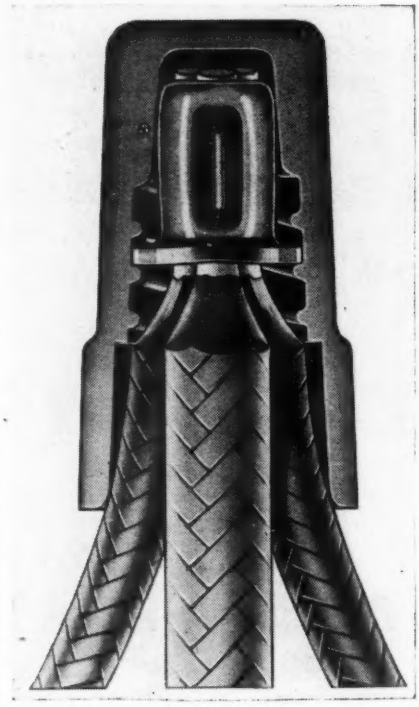
buell

Engineered Efficiency in DUST COLLECTION

and is recommended for installation of burglar alarm wiring, communication systems and similar low-voltage wiring. **Heller Co, 2153-E Superior Ave, Cleveland 14, Ohio.**

Furnace Walls E373

COMPLETELY-INSULATED, suspended wall encasements come in 3 and 4½ in. thickness. They are for convection areas and behind closely spaced tubes in boilers. Manufacturer claims individual support of each refractory unit making up the wall, as well as permanent air-tightness by effective application of insulation. **Bigelow-Liptak Corp, 2842 West Grand Blvd, Detroit 2, Mich.**



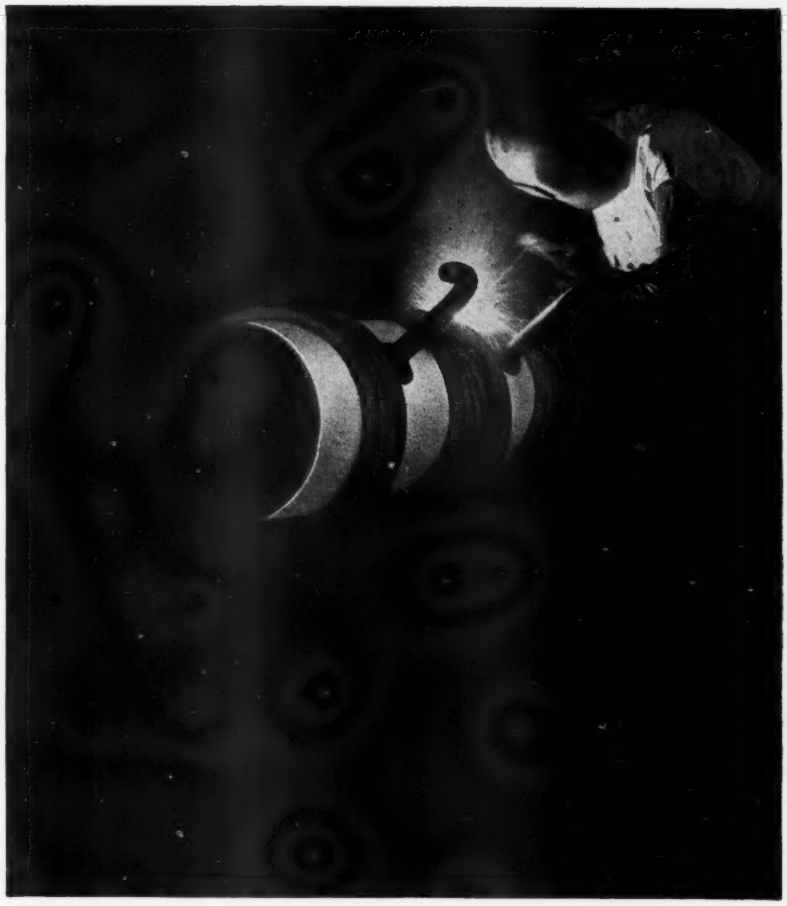
Solderless Wire Connector E374

PT-66 PIGTAIL CONNECTOR is approved by Underwriters Laboratories for use in both circuit and fixture wiring. Body of connector is made of tough bronze, electrotin plated. To assure that wires are fully inserted, both ends of the body are open for quick visual inspection. Excess wire is easily snipped off with the cutter on the manufacturer's standard tool. Once installed, the connector cannot loosen or drop off, claims the manufacturer.

Maximum wire capacity of the joint is three No. 12 awg solid or stranded wires. Over 100 wire combinations can be used in same connector. **Thomas & Betts Co, Elizabeth 1, N. J.**

Motor-Generator Set E375

NEITHER MANUAL ADJUSTMENT nor sensitive voltage regulators are required with this set to maintain correct battery-charging voltage. The *Diverter-Pole* inherently produces a constant voltage that does not become unstable because of voltage change

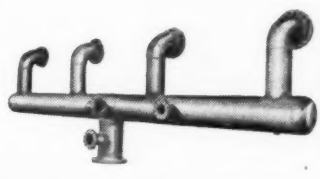


ALLOY PIPE WELDERS have to "keep their hand in" too

Like the bakers of good homemade pies, welders of alloy piping have to "keep their hand in." Their skill must be kept sharp and up to standard by constant practice, careful following of exact procedures and regular testing.

Qualified Pipe Fabricators maintain the working conditions which attract the best men in the welding trade. These men are carefully certified, follow scientifically correct procedures, have experienced supervision and their work is frequently tested. They weld pipe continually . . . which increases their skill, broadens their understanding of alloy pipe welding-problems . . . "keeps their hand in."

Qualified Pipe Fabricators are piping specialists . . . they have the experience, skilled staffs and facilities to do a better alloy piping job. They always give you a better quality—usually save you money.



THE PIPE FABRICATION INSTITUTE
Devoted to the Technical and Economic Problems in Piping
1106 CLARK BUILDING . . . PITTSBURGH, PA.

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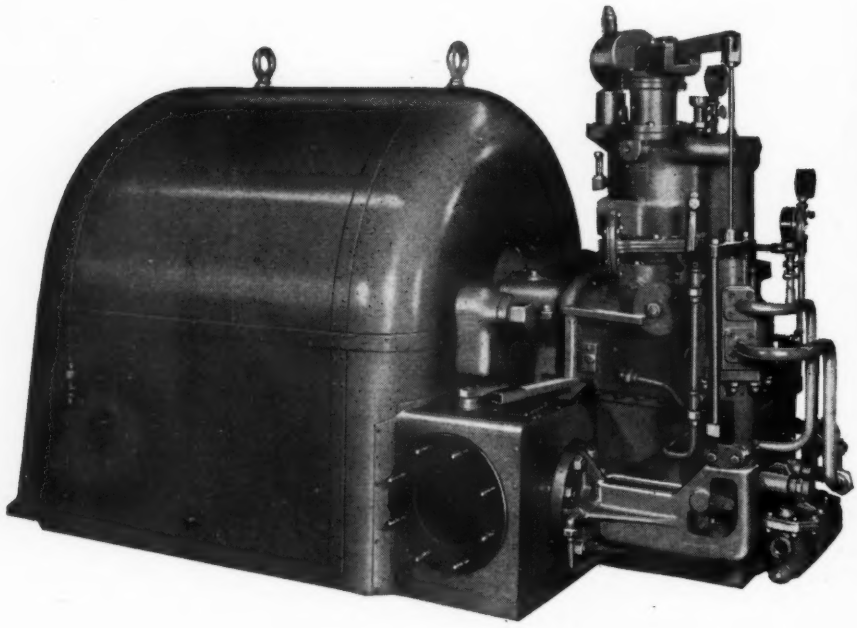
3484

MURRAY
TYPE UV



MULTI-STAGE STEAM TURBINES

Simplicity and reliability characterize the Murray Type UV Turbine. Available in from two to ten pressure stages on two basic pitch diameters. The Type UV can be supplied in capacities from 100 to 4000 HP, condensing or non-condensing. It can be used for mechanical drives or for smaller generator drives.

Murray Type UV is durably built for dependable performance. Horizontally split case construction to suit operating conditions. Blades are stainless steel, shafts of alloy steel. The assembled rotors are dynamically balanced. Governors are provided to suit specific job requirements.

Let our engineers cooperate in smoothing out your power problems.

WRITE FOR BULLETIN T-122

MURRAY IRON WORKS COMPANY

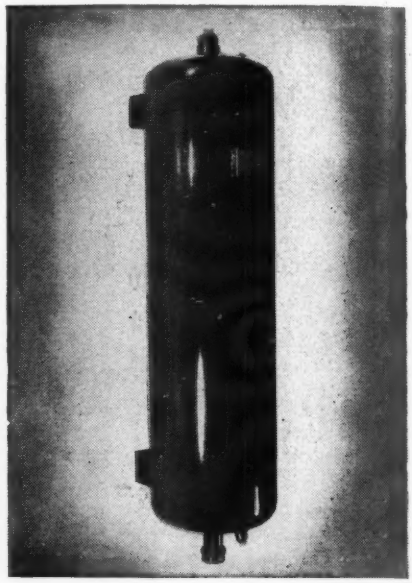
BURLINGTON, IOWA

BUILDERS OF STEAM POWER EQUIPMENT FOR THREE QUARTERS OF A CENTURY

with increasing current at any load value.

Both motor and generator are contained in one unit. The generator is capable of delivering its rated current capacity at a voltage high enough to quickly recharge the battery following a prolonged power interruption.

The *Diverter-Pole* motor-generator set is suitable for battery charging, as well as a source of direct current for control bus in main power stations and substations. **Electric Products Co. 1725 Clarkstone Rd, Cleveland 12, Ohio.**



Purifier E371

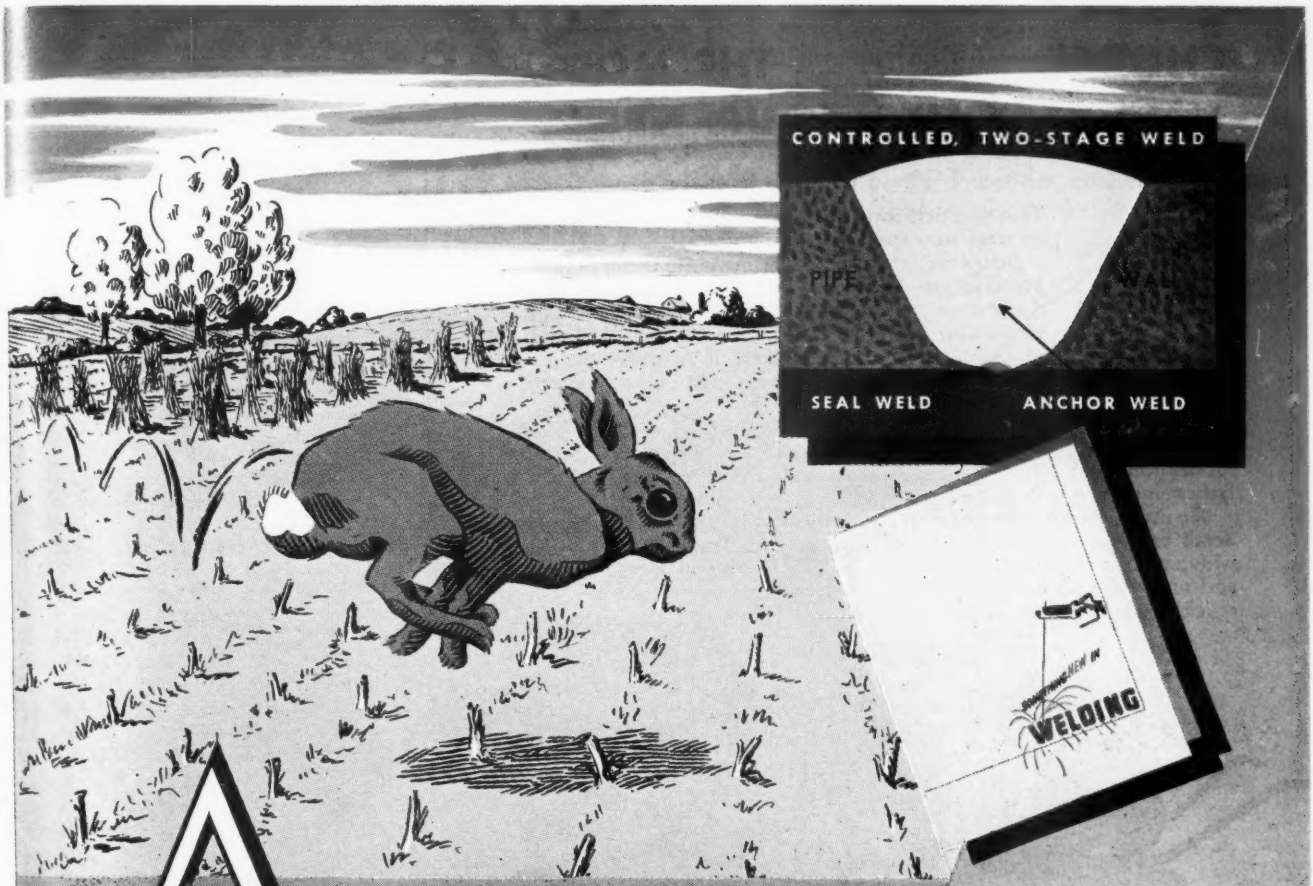
A THERMOSIPHON OIL CONDITIONER absorbs moisture, acid and sludge from transformer oil while the transformer is in operation. The unit, which may be mounted on old or new transformers, maintains transformer-oil properties essentially the same as those of new transformer oil as long as absorbent material within conditioner remains effective. The unit may also be used with transformers supplied with *Inerteen*.

After several years, if inspection and tests show oil deterioration, it is only necessary to replace the conditioner. From one to four thermosiphon oil conditioners are required, depending upon the quantity of oil in the transformer, and its design. **Westinghouse Electric Corp, Pittsburgh 30, Pa.**

Cable Reel E372

CALLED THE POWEREEL, this new device is a portable reel designed to house up to 300 ft of ¾-in, No. 12, 4-conductor cable or equivalent. Tubular steel supports are used as sled runners to facilitate passing the reel in and out of trucks. Runners are at right angles to direction of reel rotation, hence there is no tendency to slip as the cable is unwound.

Available without cable and plugs, the *Powereel* is rated 75 amp at 220 v. The standard reel has three or four collector rings; special reels and collector rings for more than four conductors may be had upon



AIMIN' AT A JUMPIN' RABBIT
Reminded us of WELDED PIPE JOINTS

Seeing our intended prey go bouncing and bounding off, somehow reminded us of the flow thru butt welded piping, where the joints are not made by the Mitchell-Westport Method of Controlled, Two-Stage Welding. Where backing rings are used, flow must bounce over the constricted inside diameter they produce and if backing rings are not used, the resultant protrusions of weld metal produce cornfield-like stubble, which flow must bound over. . . . Write for our bulletin, "Something New in Welding," which tells how almost imperceptible joints can be obtained without backing rings; how inside contours can be made smooth; how maximum bondage and strength is assured with carbon, alloy and stainless steels. Send for this bulletin today and remember, while our shop pre-fabricated piping can be made with any type of joint, we believe you'll prefer and specify the Westport.

Representatives in Boston, New York, Cleveland, Mobile and Havana

WESTPORT JOINT
(PATENTED)

W. K. MITCHELL & CO., INC.
2944 ELLSWORTH STREET
PHILADELPHIA 46, PA.
SINCE 1899

MITCHELL
PIPING FABRICATORS AND CONTRACTORS

NORTH • EAST • SOUTH • WEST • IT'S SCHRAMM!

CHOOSE *as others have* **THE MODEL THAT BEST FITS YOUR NEEDS!**

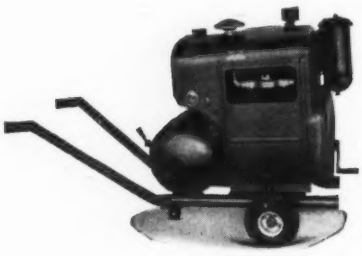
There's a Schramm Air Compressor, size and model, to meet your specific needs!

Below are listed **six** of the many Schramm models, portables ranging from 20 to 420 cu. ft. of actual air, the stationary ranging from 2 to 600 cu. ft. displacement.

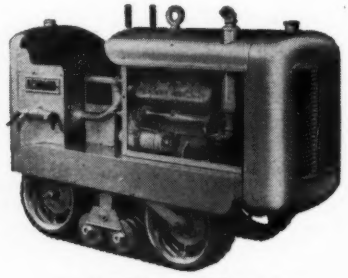
On all models performance records are evidence of their high quality. You will find the name Schramm written on every important page in compressor history.

Features you get in Schramm are: 100% water cooled, assuring ideal performance summer and winter; mechanical intake valve, forced feed lubrication, and electric-starter starting. All Schramms are compact, lightweight, easy to operate.

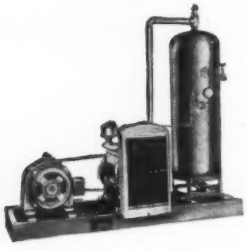
We invite you to write today for fully illustrated catalog describing in detail each of the Schramm Air Compressors shown here . . . plus a wide range of other models. We feel the Schramm story is a good one, and offers you a sure way to get your many compressed air jobs done quickly, efficiently, and economically.



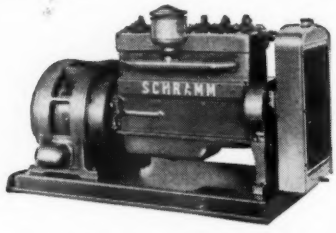
No. 20 Compressor on Shop Truck



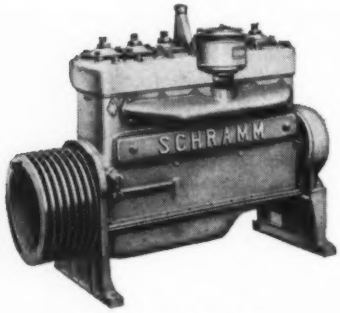
No. 60 Self-Propelled Compressor



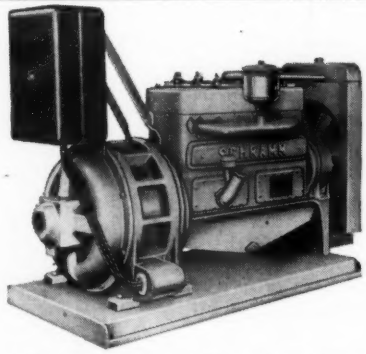
V-Belt Drive with Cooling Unit



Built-in Motor with Cooling Unit



"V" Belt on Flat Pulley Drive

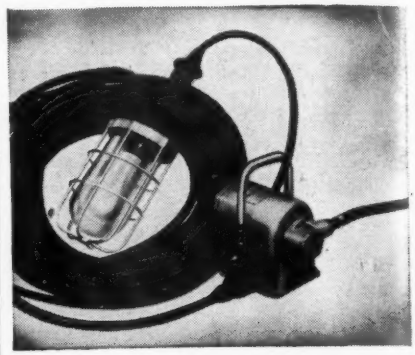


Built-in Motor Drive with Cooling Unit and Starter

SCHRAMM INC.

THE COMPRESSOR PEOPLE • WEST CHESTER • PENNSYLVANIA

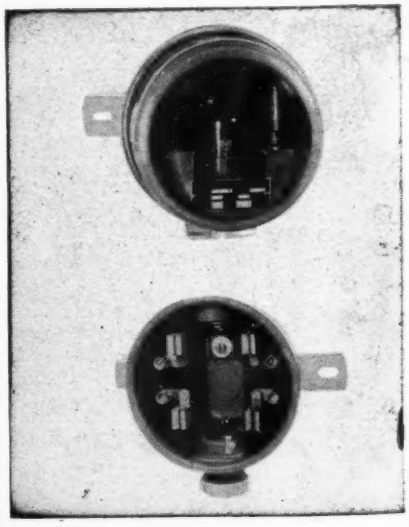
request. Unit is particularly adapted for emergency service on standby feeder lines because of power failure. **Industrial Electrical Works, 1509 Chicago St, Omaha 2, Nebr.**



Air-Powered Generator E376

THROUGH THE USE of this air-powered generator, light, for working in advance headings and mines or on dark locations on repair and public utility jobs, is now available without stringing temporary electric lines. Compressed air supplies the power to turn this generator.

Airlite cannot be harmed by short circuits or overloads and supplies ample power to operate two 75-watt 115-v bulbs. Generator measures 7¼x5x5 in. without handle and weighs 8¾ lb. Both 115- and 220-v models are available. **Ingersoll-Rand Co, 11 Broadway, New York 4, N. Y.**



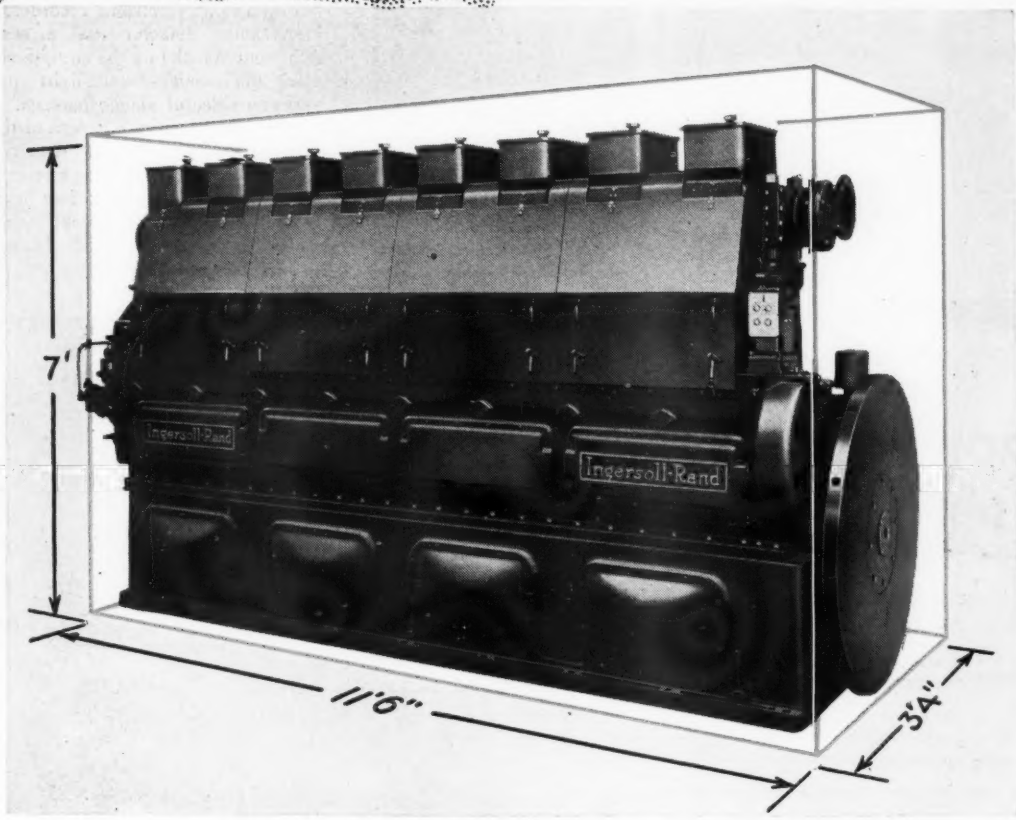
Lighting Control E377

DESIGNED TO CONTROL all types of outdoor lighting, this photoelectric lighting control has a capacity of 3000 watts of incandescent lamp load. Lights are controlled according to a preset value of daylight intensity. The standard turn-on adjustment is 0.5 foot-candles with a turn-off at 1.25 foot-candles. Provision is made for slight adjustment from the standard values.

Entire control is housed in a standard shallow watthour meter inclosure. Connections are made through a special lead-in assembly or through 1½-in. conduit. Control is designed to "fail-safe," leaving the lights turned on. Circuit has a fixed turn-off

I-R DIESELS SAVE SPACE

If you are buying a Diesel engine you know that the compactness of Ingersoll-Rand engines will pay you many dividends. It saves in foundations. It means lower transportation and rigging costs. Erection and maintenance are easier and cheaper.

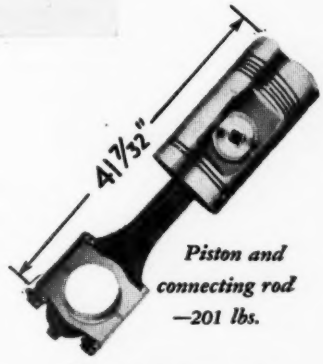


For example:

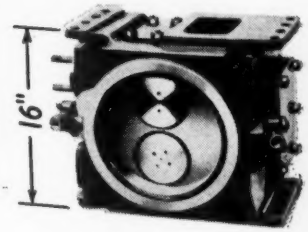
A 600 hp unsupercharged I-R Diesel weighs 12½ tons. It stands 7 feet high and can be installed through an opening of less than 6 x 9 feet. The biggest part of the engine weighs only 2½ tons. It can be transported by air if necessary.

The 720 RPM speed and combustion system make possible the use of relatively small light-weight parts without sacrificing strength. Look at the parts shown at the right and you will see what we mean.

For full details of these economical space-saving Diesels, contact your local Ingersoll-Rand office. Sizes: 225 to 600 hp for 3 to 8 cylinder unsupercharged engines—675 to 900 hp for 6, 7, and 8 cylinder supercharged engines. Bulletin on request.



Piston and connecting rod —201 lbs.



Cylinder head—310 lbs.

AIR TOOLS • COMPRESSORS • ROCK DRILLS •
CENTRIFUGAL PUMPS • TURBO BLOWERS
OIL & GAS ENGINES • CONDENSERS

Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y. 160-7

Look to these five reasons for long, trouble-free service in STRONG 70 Series Traps:

1. *Valve and seat guaranteed leakproof for one year*—made of STRONG's patented, wear-resistant Anum-Metl;
2. *Easy servicing*—permitted by the renewable seat design, cover with all working parts easily removed without breaking pipe connections;
3. *One piece bucket*—stainless steel, no welds;
4. *Turbulence avoided, choking minimized, 25% greater capacity*—with STRONG's exclusive Hi-Cap orifice;
5. *No dribbling, quick, full opening*—high ratio leverage.

STRONG *in-line* 70 Series Traps are available in sizes from ½" to 1", semi-steel construction. STRONG's "two-in-one" blast trap with integral thermal air vent is also available in the 70 Series (see cut below).

Catalog No. 67 describes these traps in detail along with other STRONG traps. Write today.

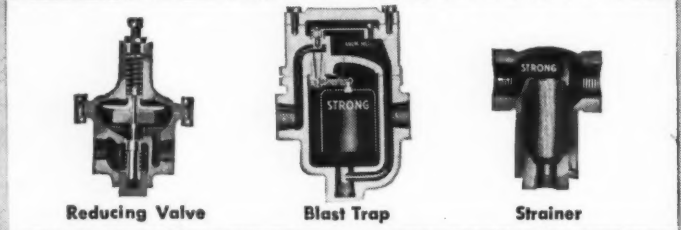
*Trademark Reg. U. S. Pat. Off.

STRONG, CARLISLE & HAMMOND COMPANY
1392 West 3rd Street
Cleveland 13, Ohio

REG. TRADE MARK

ANUM-METL Reg. Trade Mark

OTHER STRONG STEAM SPECIALTIES



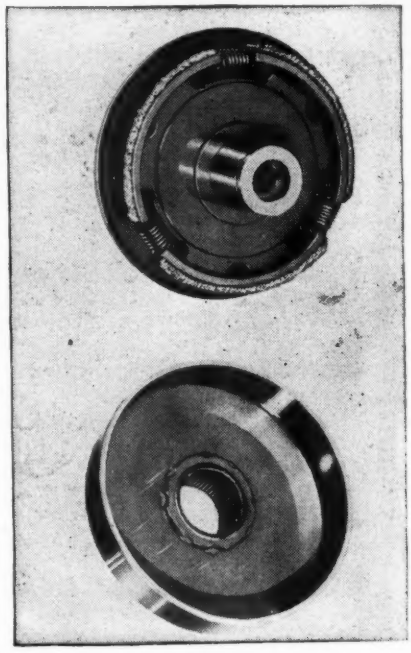
Reducing Valve Blast Trap Strainer

STRONG

delay of about 15 sec to prevent cycling because of lightning flashes, rotating aircraft beacons, or similar transients. **Dept 33, Fisher-Pierce Co, 70 Ceylon St, Boston 21, Mass.**

Smoke Recorder E378

ELECTRONICALLY OPERATED smoke-density recorder measures and records density of smoke or flue dust in flues or ducts. In addition to an electronic recorder, a bolometer smoke detector and a sealed-beam light source make up the equipment. Bolometer and sealed-beam light mount on opposite sides of smoke passage. Intensity of radiation reaching filament of the bolometer varies with smoke density in the passage. This radiation affects filament temperature and can therefore be measured as a function of filament temperature. **Bailey Meter Co, 1050 Ivanhoe Rd, Cleveland 10, Ohio.**



Centrifugal Clutch E379

EASILY ADAPTED to a wide variety of power applications, this clutch is automatic in operation and features interdirectional drive. It is suitable for electric motors or internal combustion engines, especially for small power units from fractional to 3½ hp.

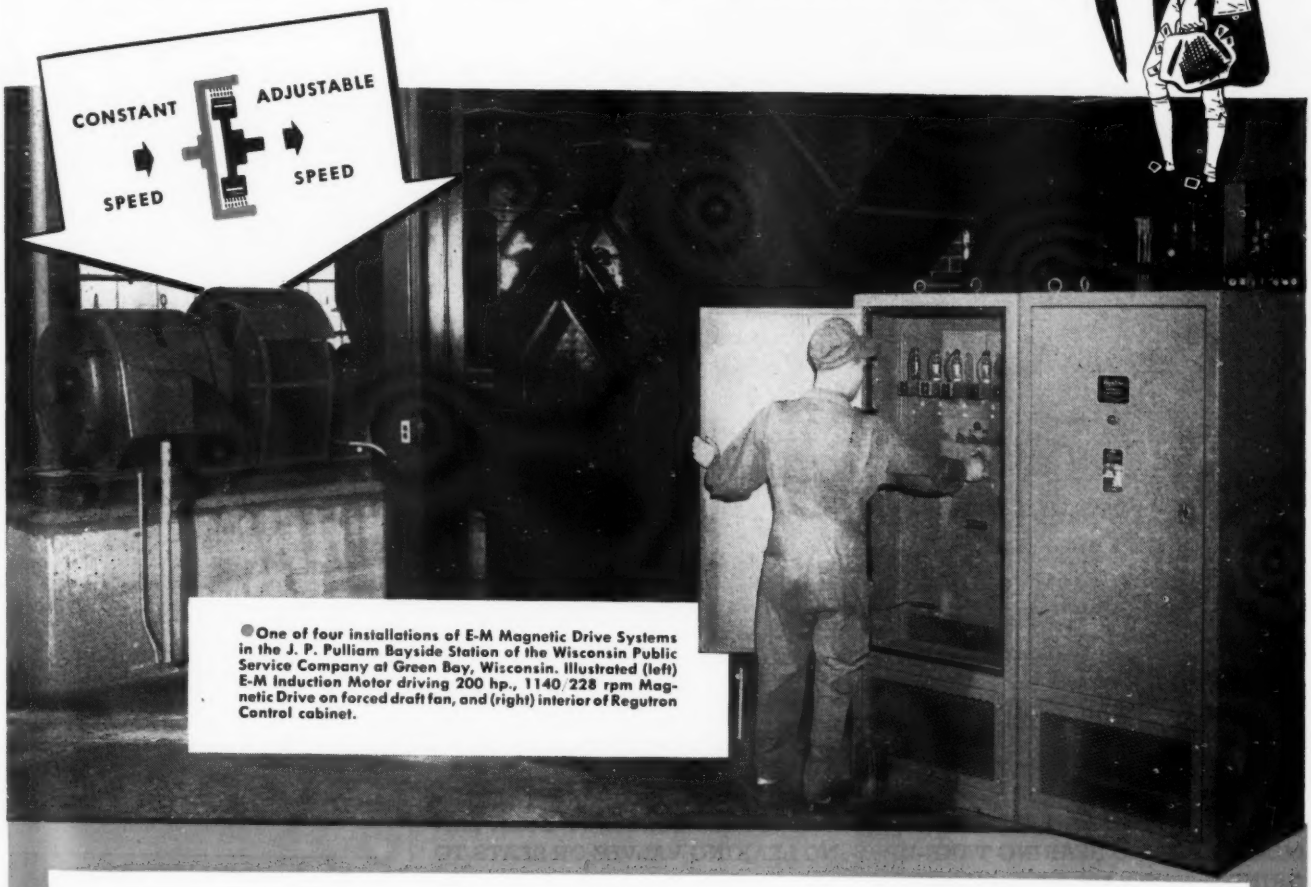
In electric-motor applications, this clutch permits use of a smaller power source delivering full peak torque at improved power factor. Internal combustion engines may be started, warmed up and idled with no load. Clutches are available in 2- and 3-shoe sizes with 4¼- and 5¼-in. drum casings respectively. **Saginaw Products Corp, 68 Williams St, Saginaw, Mich.**

Window Ventilator E380

SOLID-WELDED, projected ventilators, for use with standard interior screening on industrial plant windows, have heavy steel arms, *Lok'd Bar* intersecting joints and brass

This Fuel-Saving Scrooge

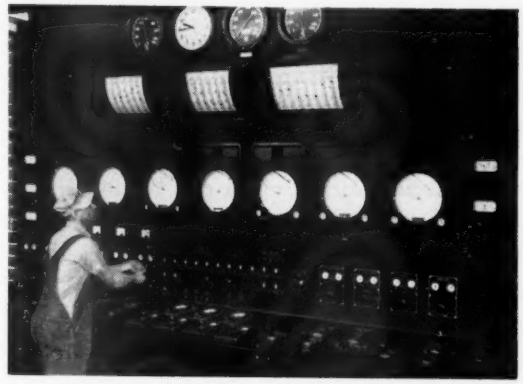
COOPERATES WITH AUTOMATIC COMBUSTION CONTROLS



One of four installations of E-M Magnetic Drive Systems in the J. P. Pulliam Bayside Station of the Wisconsin Public Service Company at Green Bay, Wisconsin. Illustrated (left) E-M Induction Motor driving 200 hp., 1140/228 rpm Magnetic Drive on forced draft fan, and (right) interior of Regutron Control cabinet.

Scrooge himself would admire this device for its conservation of fuel in steam generation—the E-M Magnetic Drive System with Regutron Control. There is nothing else like it for the boiler fan regulation necessary for the proper functioning of combustion control systems . . . nothing else that offers its precision in the control of fan speed, that responds so rapidly, that offers such a wide range of speeds in eliminating any need for dampering to secure proper air flow.

Write now for new Publication No. 1078 or call on any of our field representatives. They are all experienced electrical engineers and they will be glad to give you any technical information you need.



Meter Board That Completes Automatic Combustion Control

ELECTRIC MACHINERY MFG. COMPANY
MINNEAPOLIS 13, MINNESOTA

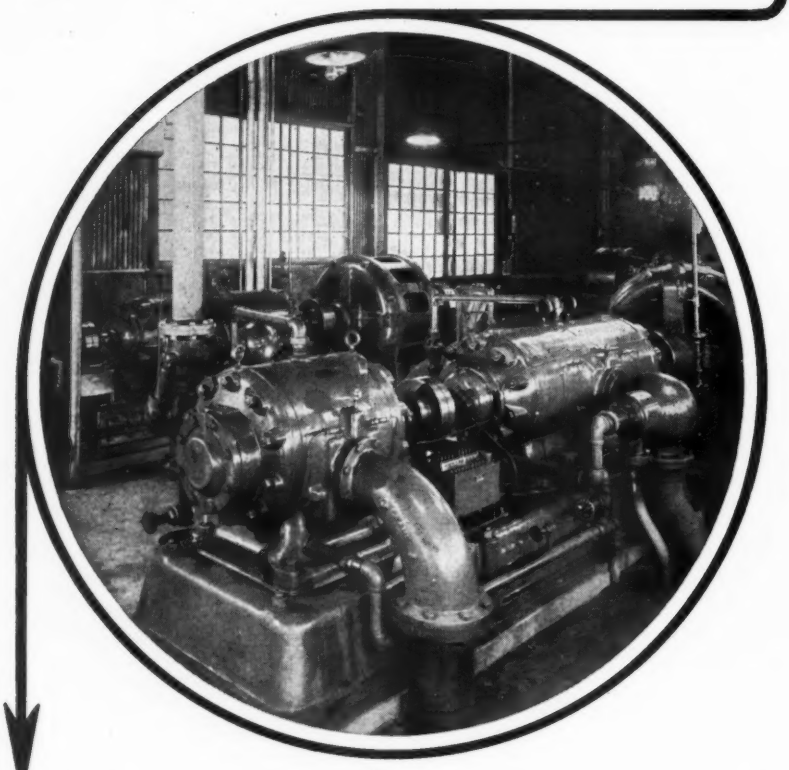
E-M

Adjustable-Speed
MAGNETIC DRIVES

4400-TPA-2078

HERE'S WHAT YOU GET WITH A

Fuller Rotary Compressor



DIRECT DRIVE . . . ACCESSIBILITY . . . LOW MAINTENANCE . . . SIMPLE FOUNDATIONS . . . BLADES AUTOMATICALLY COMPENSATE FOR WEAR . . . SMALL FLOOR SPACE WITH RELATION TO CAPACITY . . . MAINTAINED CAPACITY FOR THE LIFE OF THE MACHINE . . . UNNECESSARY BULK ELIMINATED . . . NO BEARING TAKE-UP . . . NO LEAKING VALVES OR SEATS TO GRIND . . . NO AIR-LINE PULSATIONS . . . NO MULTIPLICITY OF PARTS REQUIRING FREQUENT ATTENTION, ADJUSTMENT AND REPLACEMENT.

For years Fuller engineers have striven to build the best compressor money could buy . . . simple in design, easily operated, rugged construction for long, continuous service. With these thoughts in mind, it is natural that only the best of materials and workmanship go into the makeup of Fuller Rotaries. This continued effort has paid dividends, as is shown by the thousands of machines in operation and the many repeat orders from satisfied users.

An ideal unit for any plant. It will pay you to consider the outstanding features of these efficient machines. Write for Bulletin C-5 describing and illustrating Fuller Rotary Compressors.

FULLER COMPANY

CATASAUQUA—PENNSYLVANIA

Chicago 3 · 120 So. LaSalle St.

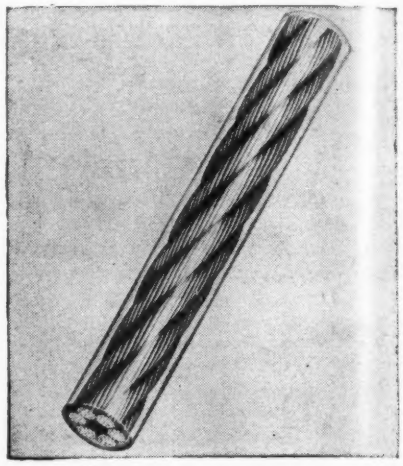
San Francisco 4 · 420 Chancery Bldg.

C-175

FULLER

A LIFETIME OF NEW MACHINE EFFICIENCY

guides. These guides slide in the frame channel. A coil spring in a brass housing holds guides in a true position. **Hope's Windows, Inc, Jamestown, N. Y.**



Nylon-Coated Wire Rope E381

TO INCREASE LIFE AND USEFULNESS of wire rope in many services it is given a coating of solid nylon. Three types of coatings are used: (1) Nylon is extruded on single strands of wire. (2) A more flexible type has the plastic applied to the outside of a complete wire rope. (3) On a still more flexible design nylon coated strands are formed into a rope. Coating unaffected by oil, cleaning fluids, marine growths, alkalies, and is not harmed by nitric, hydrochloric or sulphuric acids in concentrations up to 1%. Ropes available in sizes of 1/32 to 1 in. **Rochester Ropes, Inc, Culpeper, Va.**

Lube-Oil Testing Unit E382

DESIGNED FOR ENGINE OPERATORS, new set of equipment provides for convenient examination of diesel lubricating oil. Apparatus is compactly housed in steel floor cabinet 20 in. deep, 23 in. wide and 36 in. high. Equipment is selected to measure, simply and accurately, deterioration products responsible for engine deposits: fuel dilution, water, dirt, scuff-metal particles and acidity. Equipment also determines water

COFFIN TURBO PUMPS

HIGH SPEED • SINGLE STAGE

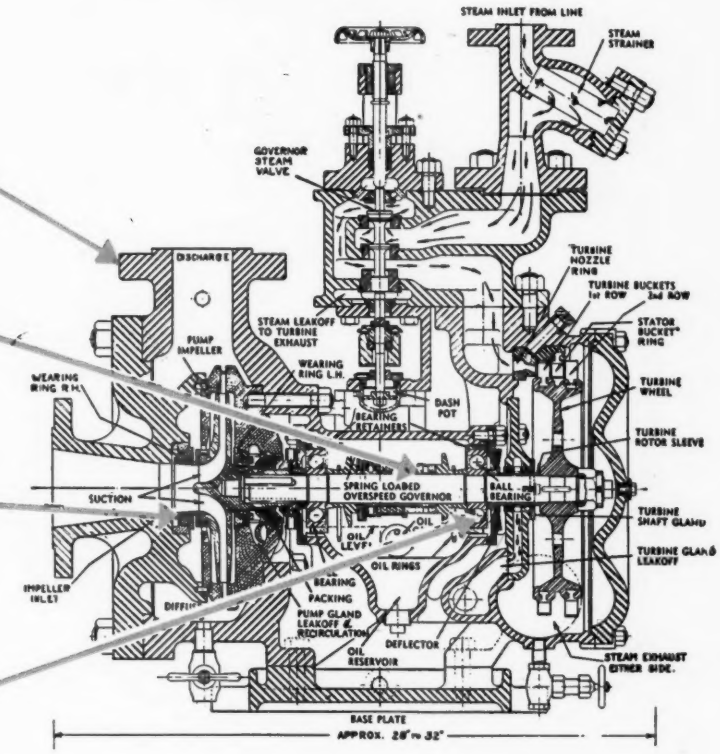
10 — No damage from accidental dry operation of the pump

Rigid one-piece steel casing; highly resistant to pipe strains

Short, rigid shaft; high first critical speed

Generous wearing ring clearances; no rubbing or dependence on water lubrication

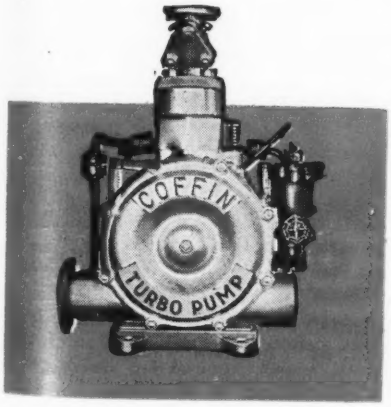
Rotor accurately centered by precision ball bearings



Standardized Boiler Feed Units for:

Steam Pressures to 650 PSI
Steam Temperatures to 850 F
Back Pressures to 60 PSI

Pump Capacities to 500 GPM
Discharge Pressures to 750 PSI (Heads to 1800 feet)
Liquid Temperatures to 300 F



See our catalog in Sweet's Power Plant and Engineering Files

UNIQUE FEATURES

1. Standardized Steam Turbine Centrifugal Pump and Governor Sets, individually engineered, assembled, and tested . . . for IMMEDIATE SHIPMENT.
2. No destructive casing erosion-corrosion.
3. No interstage leakage.
4. Wide range exact pressure governing.
5. Loss of suction reduces speed without tripping; automatic speed recovery with suction restoration.
6. High efficiency pump plus high speed two-bucket row turbine result in minimum steam consumption.
7. Matched Pump, Turbine and Governors under one responsibility.
8. Exact hydraulic and mechanical balance—light weight rotor—large bearings; result: bearing troubles practically unknown.
9. Pump Gland Leakoff provides adequate recirculation; suction pressure only on packing.
10. Rigid one-piece steel casing plus heavy shaft plus ample clearances result in no damage from dry operation.
11. All parts made to gage and replaceable without fitting; all parts in stock at factory with wearing parts available from agencies' stocks.
12. Proved for performance over a period of more than twenty years in service.
13. Compact, light in weight, quiet and low in maintenance.

Literature sent on request; specific proposals on receipt of operating date.

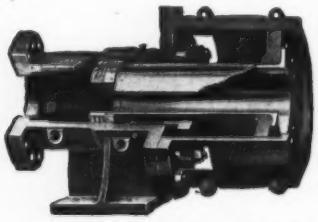
Representatives in Principal Cities

INDUSTRIAL • RAILROAD • COFFIN • MARINE • PRODUCTS • FOUNDED 1925

The J.S.COFFIN, JR., CO. 328 South Dean St. ENGLEWOOD, N.J.

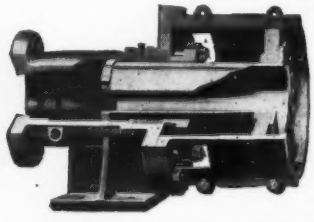
ADSCO

America's most complete line of Expansion Joints



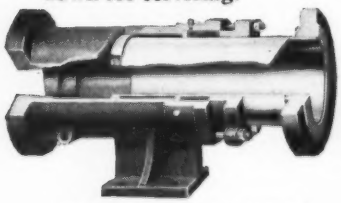
PISTON-RING EXPANSION JOINTS

An outstanding joint. Piston-Rings hold the line pressure. No shut-down for servicing.



INTERNALLY - EXTERNALLY GUIDED JOINTS

Fully guided in all positions of the slip. Ideal where long traverse is required.



INTERNALLY GUIDED JOINTS

Minimum overall size for tunnels and other jobs where space is limited.

ALL-BRONZE RISER JOINTS

Eliminate bends, complicated piping and costly "swing" joints. Write for Catalog 35.

AMERICAN DISTRICT STEAM CO.

NORTH TONAWANDA, N. Y.

SINCE 1877

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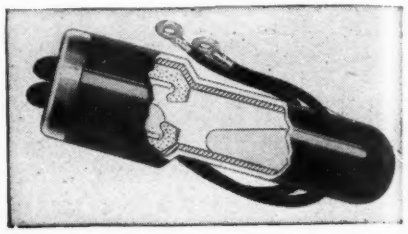
Buenos Aires, Belgrano 964
MEXICO
Mexico City, 18-56-08

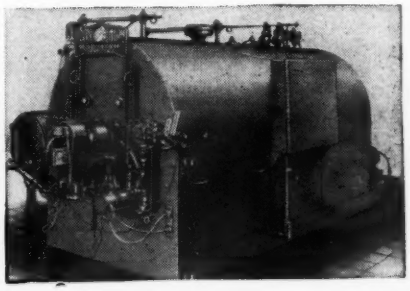
and sediment in fuel, and its gravity. Tests can be made in one-half hour per week per engine; routine use establishes continuous record of lube-oil condition. Change in rate of contamination proves, it is claimed, a sensitive indicator of conditions inside the engine and forecasts early coming need for preventive maintenance, particularly with respect to fouling of injection nozzles and the start of piston-ring gumming. **Gerin Corp, Red Bank, N. J.**



Mercury Switch E383

HYDROGEN GAS sealed under pressure in this mercury switch kills the usual arc between mercury and contact points as the device opens. As a result, corrosion of electrode is essentially eliminated. Metal case of the *Durakool* acts as one electrode, simplifying construction of switch.

Ranging in capacity from 1 to 65 amp, switches are made with or without plastic cases as standard equipment. Switches are suitable for service in high capacity, highly inductive circuits, or where variable loads place undue strain on ordinary units. **Durakool, Inc, Elkhart, Ind.**



Steam Generator E384

SPACE-SAVING CHANGES in the *Econotherm* steam generator reduce over-all height by 24 in. and length by 18 in. Condensate receiver and makeup water tank have been removed from boiler casing. In addition to space saving, manufacturer states it permits introducing preheated secondary air direct to furnace. Lowering of boiler shell, it is further claimed, eliminates some draft resistance, lowers required fan speed, gives quieter operation. **C H Dutton Co, 638 Gibson St, Kalamazoo, Mich.**

Lighting Calculator E385

FOLLOWING SLIDE-RULE DESIGN, the *Calculight-or* includes all technical information necessary to make illumination calculation either by the lumen or point-by-point methods.

No regular slide rule is required with its use nor are additional tables or charts needed for lumen-method calculation. A

Timken® bearings on crankshaft do big job for small engine

THE Hallett Manufacturing Company of Inglewood, California, uses Timken tapered roller bearings on the crankshaft of their single cylinder and two cylinder 4-cycle Diesel engines with these results:

Smoothness of operation is assured; wear on the crankshaft is eliminated; no extra thrust bearings or washers are needed; crankshaft and connecting rod are held in rigid alignment.

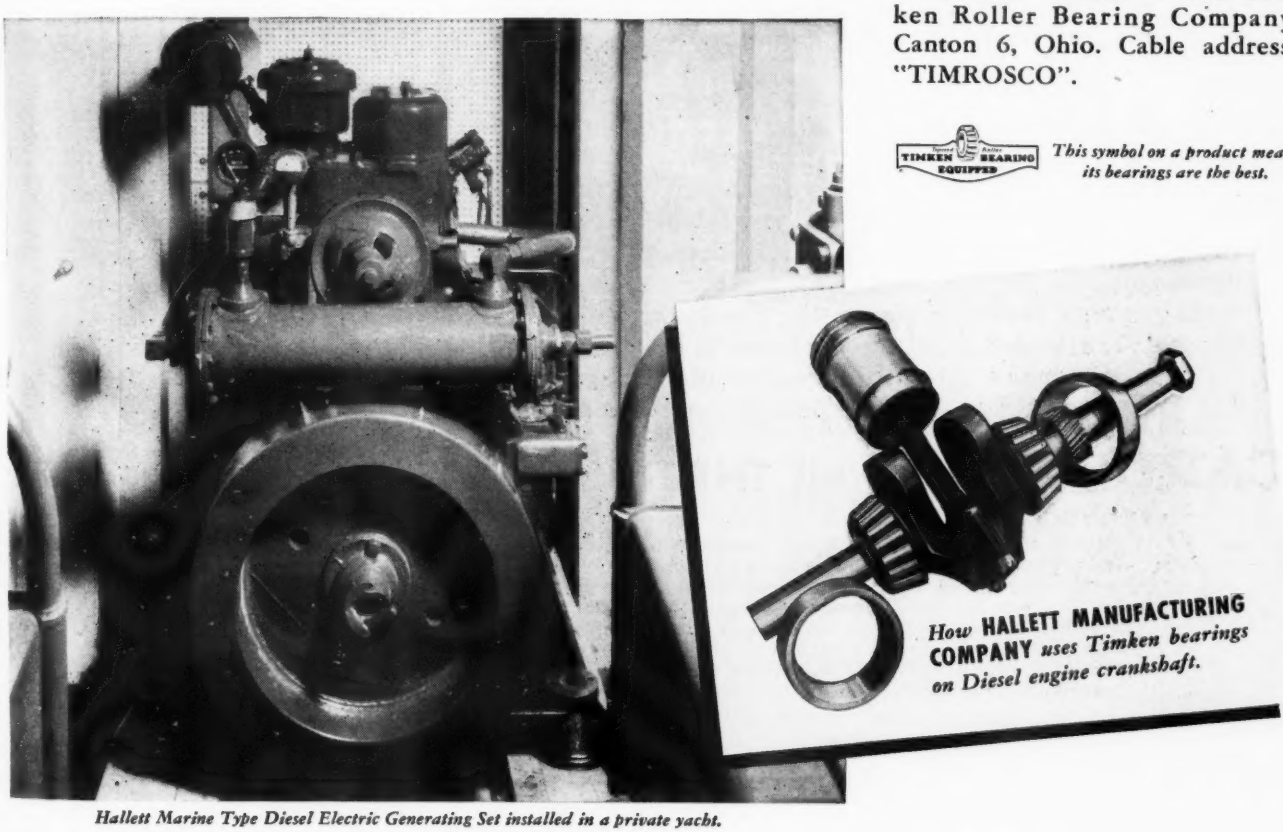
Timken bearings are designed and manufactured to last the life of the engine. Due to their tapered construction, they carry radial and thrust loads in any combination . . . without deflection or end-movement.

The rolls and races of Timken bearings are made of Timken fine alloy steel for toughness—then case-hardened to give them wear-resisting surfaces. The line contact between rolls and races provides maximum load-carrying capacity. Because Timken bearings are manufactured to extreme precision and finished to almost incredible accuracy, friction is eliminated.

Over the years, the dependable performance and continued advertising of Timken bearings have made Timken-equipped products first choice throughout all industry. Timken bearings in your product add a valuable sales feature. They build greater acceptance for your product among customers. So when you specify bearings for new equipment, always look for the trade-mark "Timken". The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

TIMKEN BEARING EQUIPPED

This symbol on a product means its bearings are the best.



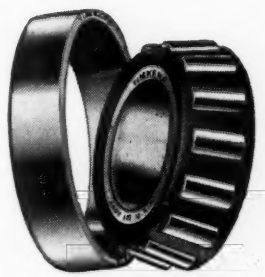
Hallett Marine Type Diesel Electric Generating Set installed in a private yacht.

TIMKEN BEARING CAPACITY RATINGS INCREASED 25%.

Since Timken bearings were re-rated some 15 years ago there has been such a further and constant improvement in quality that we are now able to announce a 25% increase in radial and thrust load carrying capacity. This may make possible the use of smaller bearings with savings in bearing cost, material cost and weight. Engineers will be able to utilize the advantages of Timken bearings in more applications than in the past.

A new Timken Engineering Journal, now in preparation, will give you complete capacity rating tabulations. For further assistance, write us today.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED
ROLLER BEARINGS



NOT JUST A BALL NOT JUST A ROLLER THE TIMKEN TAPERED ROLLER BEARING TAKES RADIAL AND THRUST LOADS OR ANY COMBINATION

Complete FIRE PROTECTION HAS 3 VITAL PHASES

- EXTINGUISHMENT
- PREVENTION
- DETECTION

Are you sure that each of these links in *your* fire protection program is as strong as it should be? A careful analysis of your fire hazards now . . . in the light of recent developments in fire protection methods and equipment . . . may save you staggering fire losses later. Let Cardox . . . a leader in all three phases of fire protection . . . help you make this property-protecting check-up! The only cost to you is a small investment in time.

CARDOX offers all THREE

EXTINGUISHMENT

Cardox engineered applications of low-pressure carbon dioxide give this fast-acting, non-damaging extinguishing medium maximum effectiveness in conquering fires, large or small, both indoors and out. Cardox Fire Extinguishing Systems offer broadscale protection with centrally located, compactly designed storage units with capacities of 500 pounds to 125 tons of Cardox CO_2, and Mobile Units with capacities of 750 pounds to 3 tons. Bulletin S-3108.

PREVENTION

Cardox Atmosphere Inerting Systems are available to provide inert gas for continuous fire and explosion prevention in the handling and storage of flammable liquids, chemicals, paints, varnishes, and solvents, or where other materials in storage present serious fire and explosion hazards. These systems also are used to provide an economical source of inert gas as part of continuous production processes. Bulletin C-3108.

DETECTION

Cardox Detection Systems, actuated by heat, smoke or flame, give prompt warning of incipient fires. These systems . . . with detectors located throughout large establishments . . . may be used purely as a warning device, or may be engineered to actuate an extinguishing system.

CARDOX

CO_2 FIRE EXTINGUISHING SYSTEMS

CARDOX CORPORATION • 307 North Michigan Avenue, Chicago 1, Illinois

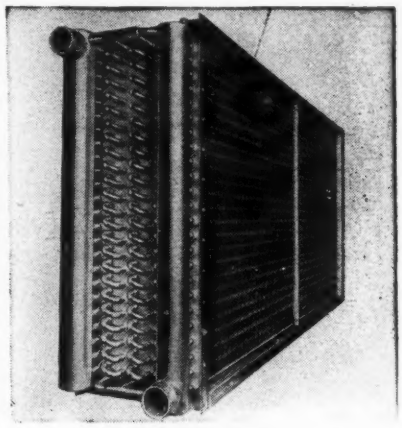
DISTRICT OFFICES: NEW YORK • PHILADELPHIA • PITTSBURGH • CLEVELAND • DETROIT ST. LOUIS • SAN FRANCISCO • SAN DIEGO

distribution curve is required for point-by-point calculation. **Westinghouse Electric Corp, 306 Fourth Ave, Pittsburgh 30, Pa.**

Furnace Observation Door E386

MAIN CASTING of door frames a 4½ in. high by 6½ in. wide observation port and is designed for mounting on a furnace wall of brick, steel or asbestos-board casing, or solid masonry. A hinged shutter, normally closed, connects to main frame on a shaft that rotates under impulse of a lever and pull chain.

An outer covering or lens frame also hinged by a shaft to the main frame has a set of three parallel pieces of $\frac{7}{32}$ in. heat-resisting blue glass through which operator can observe the fire without eye strain. **Bigelow-Liptak Corp, 2842 West Grand Blvd, Detroit 2, Mich.**



Heating and Cooling Coils E387

REDESIGNED HEATING and cooling coils feature new plate-type ripple fins. Plates are continuous with ripples made of corrugations that stiffen fins and tubes to give greater strength against deformation. In addition, tubes themselves are rippled between each and every fin to improve metal-to-metal contact. **McQuay, Inc, 1600 Broadway, N E, Minneapolis 13, Minn.**

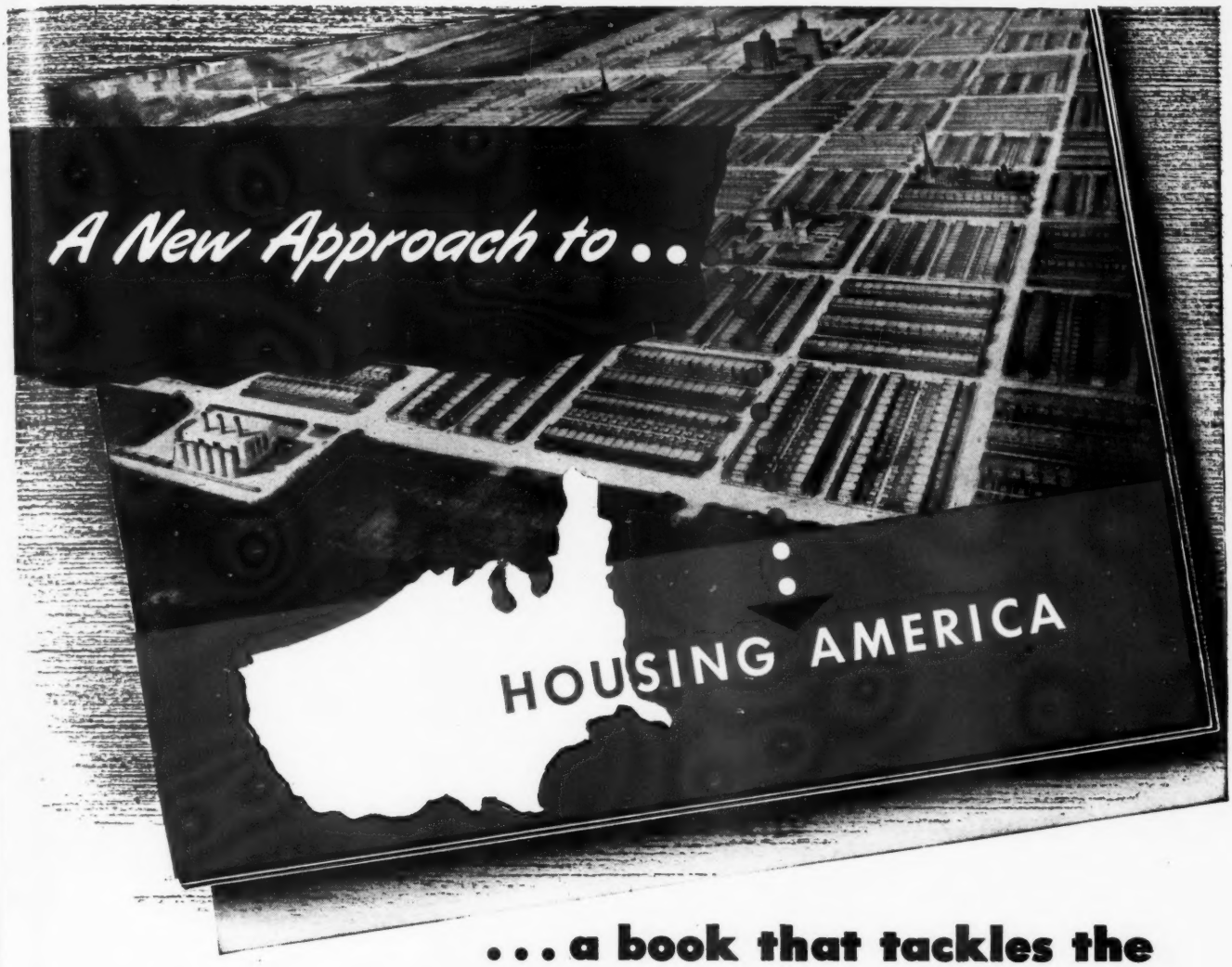
Temperature Control E388

FOR DYING AND FINISHING PLANTS, a temperature change of 0.5 F causes the control to operate a solenoid valve pilot that instantly actuates a powerful steam supply valve. Fingertip temperature-setting changes may be made by turning an adjusting screw. A built-in thermometer continuously indicates the control temperature. **Sarco Co, 350 Fifth Ave., New York 1, N. Y.**

Automatic Oiler E389

AN AUTOMATIC OILER for solid, wick or waste-packed bearings is especially designed for installation where space between oil hole and machinery is limited. Off-center speed spout makes mounting possible where clearance is as little as ¾ in.

On slight temperature rise, oiler discharges a few drops of lubricant that stops



. . . a book that tackles the Housing Problem in a Businesslike way!

EVERYONE CONCERNED with the seriousness of America's housing problem will want a copy of this book, just off the press.

Here is a straightforward statement of all the issues and factors involved in the housing problem and an equally frank presentation of a definite plan for solving it. It is comprehensive and completely to the point, we believe, and should be of positive value to every individual who has an interest in this subject.

The book includes a summary of all the principal housing proposals advanced by prominent civic leaders. It reviews the steps being taken by various cities for planned community development, and points the way to more widespread planning of this type on a broader scale. Emphasis is placed upon the necessity for adequate utility service planning in such developments and a clear cut case is made for the inclusion of centralized community heating as one of the essential utility services. Attention is also directed to the factors of fuel availability and fuel costs as being among the most important influences in community development planning.

A study of a community development of 15,900 individual homes is another important feature of the book. This section includes a detailed engineering analysis, by a nationally prominent consulting engineer, of the recommended central heating system, comparing its construction and operating costs with the corresponding costs of individual heating plants for each separate dwelling unit.

An informative appendix comprises a resume of some twelve major housing developments sponsored by major life insurance companies and saving banks, with particular attention given to the heating systems of each project.

This book is not a piece of advertising, but a practical reference on the status of mass housing to date, for the use of anyone actively interested in housing developments. If you have bona fide use for it, please write us on your business stationery and we shall be glad to forward you a copy without charge or obligation.

RIC-WIL

INSULATED PIPE CONDUIT SYSTEMS

THE RIC-WIL COMPANY • CLEVELAND, OHIO

CABLE ADDRESS: RICWIL, BENTLEY'S CODE

Wing

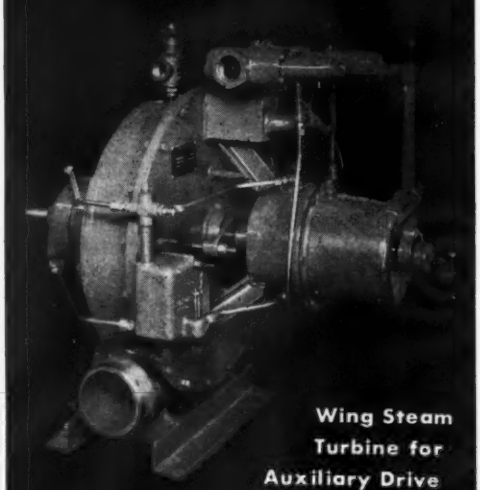
AUXILIARY TURBINES

Wing All-Steel Welded Vertical Turbine for Pump Drive

Wing Steam Turbines have been a dependable source of power in industrial and marine applications for over a third of a century. During that time these sturdy, dependable prime movers have been giving satisfactory service in thousands of industrial and marine installations under the most exacting conditions of service.

Wing turbines today are available for pressures up to 600 psi. and temperatures up to 750° F.

Write for turbine bulletin or for specific details.



Wing Steam Turbine for Auxiliary Drive

L. J. Wing Mfg. Co.
50 Seventh Ave.
New York 11, N. Y.
Factories:
Newark, N. J. • Montreal, Can.

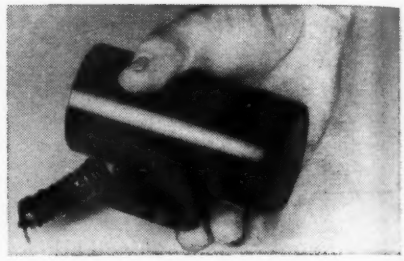
Wing Turbine and Gear Combination on common pedestal base

automatically as oil cools bearing. Operation is constant and positive with refilling of visible reservoir the only attention necessary. **Trico Fuse Mfg Co, 2948 N 5th St, Milwaukee, Wis.**

Steam Cleaner E390

PORTABLE, HEAVY-DUTY, 400-lb steam generator mounts on steel dolly with ball-bearing, rubber-tired swivel casters. Equipment includes high-pressure steam and detergent hose, nozzle and controls.

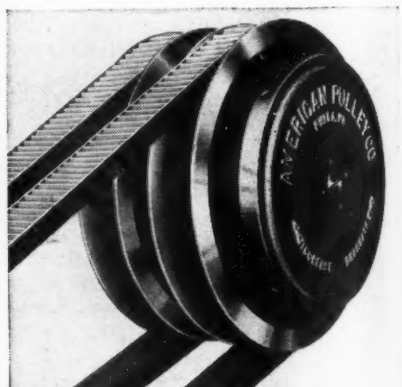
Speedylectric steam-jet cleaner operates on ac, 220 v and over, single or polyphase. It has a capacity of 28 kw for electric energy to heat steam. A pressure tank containing detergent or solvent assures a positive flow to cleaning nozzle. **Livingstone Engrg Co, 100 Grove St, Worcester, Mass.**



Motor Capacitor E391

DESIGNED TO WITHSTAND the same physical treatment as the motor itself, this new *Pyranol* motor capacitor is available in all popular ratings.

Bushings are of silicone, sealing permanently by compression without need of gaskets or stickers. Long *Flamenol* leads are protected by insulating eyelets that are unaffected by baking heat, oil, water or mild acids. **General Electric Co, Schenectady 5, N. Y.**



Adjustable Sheave E392

NEW CONSTRUCTION FEATURE of this adjustable sheave is rubber-lagged hub upon which sheave flanges are mounted. Bonded to steel hub of sheave, the rubber section eliminates freezing by acting as an insulating cushion between flanges and hub of sheave.

In addition, this wide-range, adjustable-

(*Continued on page* 216)

Reader Service Page for . . .

NEW EQUIPMENT and TECHNICAL LITERATURE

Use the handy FREE service cards for additional information on this month's new products or for copies of latest trade catalogs.

NEW PRODUCTS & MATERIALS

See equipment pages 146-150, 158-160, 184-206, 216-222

Dual-Fuel-Engine Control .....page 146
Welding Rod .....page 146
Air Vent .....page 146
Electrical Insulation .....page 146
Spreader Stoker .....page 146
Engine Air Starters.....page 148
Needle Valve .....page 148
Pulley Lagging .....page 148
Synchronous Motor .....page 148
Refrigeration .....page 148
Instrument Cabinet .....page 148
Regulated Rectifier .....page 148
Condensate Returns .....page 150
Unit Heaters .....page 150
Air Starting Motors.....page 150
Blowndown Valve .....page 150
Electrical Connector .....page 150
Rotary Hand Pump.....page 150
Selenium Rectifer .....page 150
Flow Tube .....page 150
CO_2 Indicator .....page 158
Magnetic Pulley .....page 158
Water-Level Indicator .....page 158
Thermocouple Panel .....page 158
Piston Rings .....page 158
Synchronous Generator .....page 158
Industrial Diesel .....page 158
Magnetic Starter .....page 160
Light-Beam Wattmeter .....page 160
Oil Circuit Breaker.....page 160
Packaged Air Conditioners.....page 160
Pump Control .....page 160
Thread Cleaner .....page 160
Welding Rod .....page 160
Synchronous Differential .....page 160
Three-Fuel Boiler .....page 184
Fuel-Injection Pump .....page 184
Electrostatic Voltmeter .....page 186
Pneumatic Timer .....page 188
Wire Stapling Gun.....page 188
Furnace Walls .....page 192
Solderless Wire Connector.....page 192
Motor-Generator Set .....page 192
Purifier .....page 194
Cable Reel .....page 194
Air-Powered Generator .....page 196
Lighting Control .....page 196
Smoke Recorder .....page 198
Centrifugal Clutch .....page 198
Window Ventilator .....page 198
Nylon-Coated Wire Rope.....page 200
Lube-Oil Testing Unit.....page 200
Mercury Switch .....page 202
Steam Generator .....page 202
Lighting Calculator .....page 202
Furnace Observation Door.....page 204
Heating and Cooling Coils.....page 204
Temperature Control .....page 204
Automatic Oiler .....page 204

(Turn over for other items)

HOW TO ORDER ADDITIONAL DATA

Be sure to fill out, completely, one coupon for each item of information you order. (See sample, right.) This gives your request authority and helps the manufacturer to address your copy completely.

When you have filled out completely one space for each item of information you want, detach along the scored lines and drop the cards in the mail.

Example

Write here number of item in which you are interested → E17

Your Company Name Brown Mfg. Co.

Address 3718 First Avenue, Pottsville, Okla.

Your Name John Smith

Your Title Power Engineer

POWER, 330 West 42nd St., New York 18, N. Y.

FILL OUT AND MAIL TODAY! NOT GOOD AFTER JAN 1, 1949

Write in circle number of equipment item on which data is wanted →

Your Company Name.....

Address .....

.....

Your Name .....

Your Title .....

POWER, 330 West 42nd St., New York 18, N. Y. 10/48

Write in circle number of equipment item on which data is wanted →

Your Company Name.....

Address .....

.....

Your Name .....

Your Title .....

POWER, 330 West 42nd St., New York 18, N. Y. 10/48

Write in circle number of equipment item on which data is wanted →

Your Company Name.....

Address .....

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Your Name .....

Your Title .....

POWER, 330 West 42nd St., New York 18, N. Y. 10/48

Write in circle number of equipment item on which data is wanted →

Your Company Name.....

Address .....

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Your Name .....

Your Title .....

POWER, 330 West 42nd St., New York 18, N. Y. 10/48

Write in circle number of equipment item on which data is wanted →

Your Company Name.....

Address .....

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Your Name .....

Your Title .....

POWER, 330 West 42nd St., New York 18, N. Y. 10/48

Write in circle number of equipment item on which data is wanted →

Your Company Name.....

Address .....

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Your Name .....

Your Title .....

POWER, 330 West 42nd St., New York 18, N. Y. 10/48

Write in circle number of equipment item on which data is wanted →

Your Company Name.....

Address .....

.....

Your Name .....

Your Title .....

POWER, 330 West 42nd St., New York 18, N. Y. 10/48

Steam Cleaner .....page 206
Motor Capacitor .....page 206
Adjustable Sheave .....page 206
Oil Burner .....page 216
Circuit Breaker .....page 216
Wire Insulation .....page 216
Drum Pump .....page 218
Hard-Facing Electrodes .....page 218
Flame-Failure Device .....page 218
Turboblowers .....page 220
Voltage Stabilizers .....page 220
Oil-Immersed Rectifier .....page 220
Turbine Pump .....page 222
Dual-Fuel Burner .....page 222
Air-Filter .....page 222
Refractories .....page 222
Paint .....page 222

MANUFACTURERS' BULLETINS

See this page and pages 208-212

Air Conditioning, Heating, Refrigeration and Ventilating..page 206b
Boilers and Auxiliaries.....page 206b
Controls, Electric .....page 206b
Electrical Equipment .....page 206b
Maintenance and Safety Equipment.page 208
Maintenance Materials .....page 208
Materials Handling .....page 208
Mechanical Transmission .....page 210
Meters and Instruments, Mechanical .....page 210
Piping, Fittings, Valves and Specialties.....page 210
Other Equipment .....page 212

AIR CONDITIONING, HEATING, REFRIGERATION AND VENTILATING

1 UNIT HEATER MAINTENANCE — Modine Mfg Co, Racine, Wis. Chart lists vital points to check on motors, condensers and casings of unit heaters to assure trouble-free service during heating season.

All literature designated with a star (★) may be obtained only by writing direct to the manufacturer on company letterhead, giving writer's name and title.

★ **UNIT HEATER** — Thermobloc Div, Prat-Daniel Corp, 74 Water St, E Port Chester, Conn. 8-page bulletin No. 300 covers Thermobloc unit heater, a self-contained direct-fired unit only 30 in. in dia, with output of 550,000 Btu per hr.

2 EVAPORATIVE COOLERS—Air Conditioning and Refrigeration Div, Worthington Pump and Machinery Corp, Harrison, N. J. 8-page bulletin No. C-1100-B27A gives specifications for Worthington WCZ series evaporative coolers.

BOILERS AND AUXILIARIES

3 PACKAGED BOILERS — Union Iron Works, Erie, Pa. 4-page bulletin No. 120 describes construction of Union Little Giant boilers. Dimensions are given.

4 DUAL-FUEL BURNING SYSTEMS—North American Mfg Co, Cleveland 4, Ohio. 4-page bulletin No. DF gives advantages of North American dual-fuel burning systems.

5 WATERTUBE POWER BOILERS—International Boiler Works Co, East Stroudsburg, Pa. 8-page folder covers latest International watertube boilers, Type CR.

6 TURBO BLOWERS—North American Mfg Co, Cleveland 4, Ohio. 6-page bulletin No. 300-S and 4-page bulletin No. 300 discuss Series 300 turbine blowers for industrial combustion systems.

7 REFRACTORY ENCLOSURES — Geo P Reintjes Co, 2515 Jefferson St, Kansas City, Mo. 4-page bulletin No. 748, entitled "Floating Walls," discusses new problems encountered in designing air-tight refractory enclosures for modern water walled boilers and their solution.

8 CONDENSATE RETURN SYSTEMS—Cochrane Corp, 17th St & Allegheny Ave, Philadelphia 32, Pa. 4-page publication No. 3250-1 gives material and operating specifications, and capacity ratings of CBA high-differential high-pressure condensate return systems.

CONTROLS, ELECTRIC

9 ATMOSPHERIC REGULATORS — North American Mfg Co, Cleveland 4, Ohio. Bulletin No. 18 discusses North American Series 18 atmospheric regulators.

10 AUTOMATIC CONTROLS — Automatic Control Co, St. Paul 4, Minn. 6-page bulletin No. CP-2 gives description and price of Tanktrols, Mototrols, Duotrols, Prob-O-Trols, Selectrols, float switches, timers, alternators, alarm panels and silencers, accessories.

11 MOTOR CONTROLS — Industrial Controller Div, Square D Co, 4041 N Richards St, Milwaukee 12, Wis. New sheets for Square D's electric motor control catalog cover relays, contactors, parts kits, resistors, etc.

ELECTRICAL EQUIPMENT

12 INSTRUMENT PANELS AND CUBICLES—Falstrom Co, Passaic, N. J. 12-page bulletin No. 125-5-47, entitled "Modern Design for Instrument Panels and Cubicles," covers the Falstrom line. 4-page bulletin No. 126 discusses Falstrom control centers.

13 MULTIPLE-CIRCUIT BATTERY CHARGERS—Electric Products Co, 1725 Clarkstone Rd, Cleveland 12, Ohio. 4-page bulletin No. 222 describes construction of company's multiple-circuit battery chargers.

14 INDUSTRIAL MOTORS—Lima Electric Motor Co, Lima, Ohio. 6-page bulletin No. MB-1 presents Lima line of electric motors, multispeed gearshift drives, pedestal grinders, etc.

15 SYNCHRONOUS GENERATOR — Electric Power Div, Elliott Co, Jeannette, Pa. 4-page bulletin No. PB2000 covers Elliott's low-speed Fabri-steel synchronous generator.

16 SOLENOID CONTACTORS — Ward Leonard Electric Co, 31 South St, Mt. Vernon, N. Y. 4-page bulletin No. 4452-4453 presents Sizes 2 and 3 ac solenoid contactors.

(*Continued on page 208*)

FIRST CLASS
PERMIT No. 64
(Sec.510,P.L.&R.)
NEW YORK,N.Y.

BUSINESS REPLY CARD
NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

4c. Postage Will Be Paid By—

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330 West 42nd Street

New York 18, N. Y.

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PERMIT No. 64
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330 West 42nd Street

New York 18, N. Y.

DON'T SAY "ANTIMONIAL ADMIRALTY"—

SAY "CHASE ANTIMONIAL ADMIRALTY"

It could well mean a great saving to you.

You see, the minimum percentage of antimony set forth in Chase Patent No. 2,061,921 is .007%. Under certain mild exposure conditions this quantity would prove effective. However, experience has shown that a minimum of about .015% is essential to give reasonably complete protection against dezincification under the entire range of conditions.

To assure you this .015% minimum, Chase manufacturing processes incorporate nominally .035% antimony in their admiralty. Why risk tube failures when you can specify *Chase* Antimonial Admiralty, *which costs you no more than plain Admiralty*. Write or call your nearest Chase Warehouse or Sales Office today, listed below.

Special stocks of ANTIMONIAL ADMIRALTY Condenser Tubes in Chase Warehouses: BALTIMORE, NEW ORLEANS LOS ANGELES, SAN FRANCISCO *also carried by*— Vinson Supply Co., Tulsa Standard Brass & Mfg. Co., Houston

Chase

WATERBURY 91, CONNECTICUT

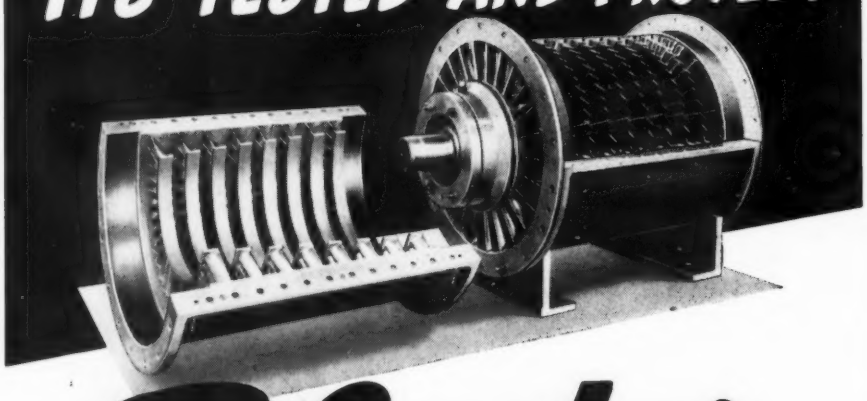
the Nation's Headquarters for BRASS & COPPER

SUBSIDIARY OF KENNECOTT COPPER CORPORATION

THIS IS THE CHASE NETWORK . . . *handiest way to buy brass*

ALBANY† ATLANTA BALTIMORE BOSTON CHICAGO CINCINNATI CLEVELAND DETROIT HOUSTON† INDIANAPOLIS KANSAS CITY, MO. LOS ANGELES MILWAUKEE MINNEAPOLIS NEWARK NEW ORLEANS NEW YORK PHILADELPHIA PITTSBURGH PROVIDENCE ROCHESTER† SAN FRANCISCO SEATTLE ST. LOUIS WATERBURY (†Indicates Sales Office Only)

IT'S NEW! IT'S DIFFERENT! IT'S TESTED AND PROVED!



Flader

Axial Flow Compressor

• Now—you can purchase an axial flow compressor which can deliver from 8000 to 300,000 cfm and pressures up to 100 psi may be obtained in a single unit. Capacities lower than 8000 cfm are available on special order. This Flader Compressor introduces an entirely new principle of industrial compressor design. It provides operating efficiency up to 88% and saves up to 20% power consumption in the larger sizes.

Floor area and general space requirements are less than 10% those needed for other type compressors and the weight is less than 10% of other type compressor weights. Drive may be either electrical, steam or gas turbine. Gas turbine drives are manufactured by us.

Write for Bulletin and further information.

This model only 22 inches long between flanges—only 17 inches case diameter yet delivers 18,000 cfm at 25 psig.

Fredric Flader, Inc.

NORTH TONAWANDA,
NEW YORK, U. S. A.

For Economical Production of Compressed Air in Large Volume

MAINTENANCE AND SAFETY EQUIPMENT

17 GAS-ELECTRIC BLOWTORCH — North American Mfg Co, 4455 E 71st St, Cleveland 5, Ohio. Bulletin No. 176 gives installation instructions for North American portable gas-electric blowtorch.

18 POWER TOOLS—Syntron Co, Homer City, Pa. 22-page catalog No. 486 describes entire line of Syntron power tools, including portable electric hammers, concrete form vibrators, portable electric drills, grinders, sanders, etc.

19 DRUM WRENCH — Aero Tool Co, 6930 Avalon Blvd, Los Angeles 3, Calif. Catalog sheet presents Aero No. 5001 drum wrench. Diagrams are included.

20 INDUSTRIAL DRILLS — Precision Equipment Co, 2658 North Long Ave, Chicago 39, Ill. Sheet gives specifications of Hi-Power ½-in. electric drill.

MAINTENANCE MATERIALS

21 CONCRETE FLOORING — Walter Maguire Co, 330 W 42nd St, New York 18, N. Y. 4-page bulletin No. K-801 lists a few of the largest representative organizations in manufacturing, dairy, meat packing and railroad industries with their types of flooring problems.

22 PROTECTIVE COATINGS — Prufcoat Laboratories, Inc, 63 Main St, Cambridge, Mass. 4-page folder shows how Prufcoat coatings cut painting maintenance costs by providing machinery, equipment, walls, floors, etc, with effective protection against corrosion from acids, alkalies, oil and water.

23 SEALING AND LUBRICATING COMPOUNDS—Parker Appliance Co, 17325 Euclid Ave, Cleveland 12, Ohio. Catalog No. 909 describes properties of valve lubricants, thread sealing, line sealing, gasket and anti-seize compounds for many types of tubing and piping systems.

24 FLOOR REPAIR—Stonhard Co, 1306 Spring Garden St, Philadelphia 23, Pa. Folder, entitled "One-Two-Three," tells how floors can be made smooth and safe in three easy steps with Stonhard Stonfast.

25 PUMP PACKINGS — Johns-Manville Corp, 22 E 40th St, New York 16, N. Y. 4-page booklet No. PK-39A recommends different packings for various types of pumps. Charts and photos explain where the packings are used in the pumps.

26 SYNTHETIC ELASTIC COMPOSITIONS—Fabrics Div, E I du Pont de Nemours & Co, Fairfield, Conn. 12-page manual describes properties and uses of Fairprene synthetic elastic compositions.

27 PROTECTIVE COATING FOR INSULATION—Bitucote Products Div, Bridges Paving Co, 1411 Central Industrial Dr, St. Louis 10, Mo. Bulletin discusses how insulations can be protected by Protektite from fire, water, corrosives and weather.

MATERIALS HANDLING

28 PERMANENT MAGNETIC SEPARATORS—Eriez Mfg Co, 283 E 12th St, Erie, Pa. 8-page catalog No. 2 discusses complete line of Eriez permanent non-electric magnetic separators.

29 CRANE SCALES — Yale & Towne Mfg Co, 4530 Tacony St, Philadelphia 24, Pa. Bulletin No. P-714K describes crane scales for loads up to 25 tons.

30 FEEDERS AND ROTARY VALVES —Fuller Co, Fuller Bldg, Catasauqua, Pa. 8-page bulletin No. F-3 covers Fuller feeders and rotary valves for dry pulverized and granular materials.

31 STEEL-WIRE ROPE — Rochester Ropes, Inc, 540 Water St, New York 2, N. Y. Pamphlet and tear sheets present Wirelon, a steel-wire rope with a tough translucent cover of solid Du Pont nylon that is said to guard against dirt and corrosion.

32 DIESEL TRACTORS — Caterpillar Tractor Co, Peoria 8, Ill. 32-page booklet, Form No. 10750, gives design and manufacturing points of the Caterpillar

THESE TROUBLEMAKERS

IN PLANTS EQUIPPED with

CASH STANDARD Streamlined PRESSURE REDUCING VALVES TYPE 1000

THESE *Users* TELL WHY . . .

A Conditioning Corp. writes—

"Had a very critical job where it was important to HOLD CONSTANT PRESSURE TO VERY CLOSE TOLERANCES because we were using steam to reheat air to a set degree with allowed variation of less than one degree. Changed pressure reducing valves twice, then tried a CASH STANDARD Type '1000' and were able to accomplish the job."

A Maintenance Engineer says—

"I would be more than willing to recommend the performance of the CASH STANDARD Type '1000' Pressure Reducing Valve because we used the valve here UNDER ADVERSE CONDITIONS and found it PERFECT IN EVERY WAY—TROUBLE FREE and PRACTICALLY NO MAINTENANCE COSTS."

A Supt. of a Public Utility says—

"We operate a CASH STANDARD '1000' valve reducing steam pressure from 400 to 175 lbs. on our low pressure steam turbines' condenser air ejectors which is an important function and it has done the job WITHOUT FAILURE TO DATE."

A Tobacco Co. writes—

"We use only one '1000' valve in this department. It is used on the steam line to our Castle Autoclave (tough service). Our experience has been CONTINUOUS SMOOTH OPERATION for several years."

An Instrument Co. writes—

"Control of gasoline pressure on flo range of 5-4000 p. p. h. at 17½ psi. CONSTANT PRESSURE CONTROL over full range within 5%. This was on production test stands used for checking solid fuel injection on aircraft motors."

WRITE FOR BULLETIN 962

Note the benefits users say they get from their CASH STANDARD Type '1000' Pressure Reducing Valves.

Check the benefits with this list

1. **Maximum capacity when needed most.**
2. **Accurate pressure control under toughest working conditions.**
3. **Trouble-free service.**
4. **Smooth operation.**
5. **Tight closure.**
6. **Speedier production results.**
7. **Elimination of failures.**
8. **Cost-saving operation.**
9. **No spoilage.**
10. **Practically zero in maintenance.**

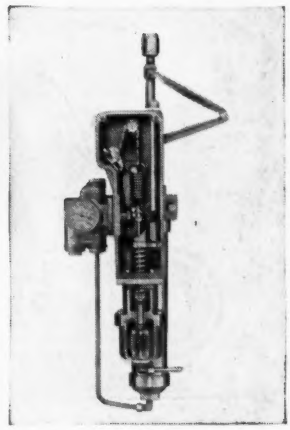
CASH STANDARD CONTROLS . . . VALVES

A. W. CASH COMPANY

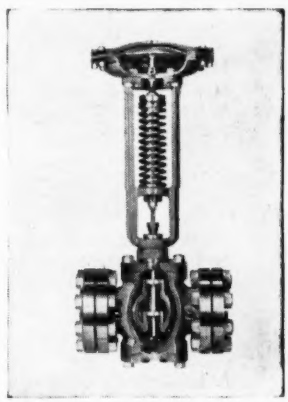
DECATUR, ILLINOIS

BULLETINS AVAILABLE ON OTHER CASH STANDARD VALVES

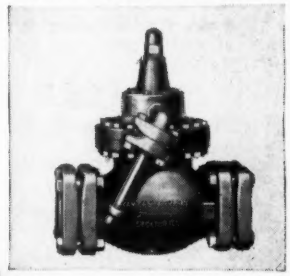
Send for them



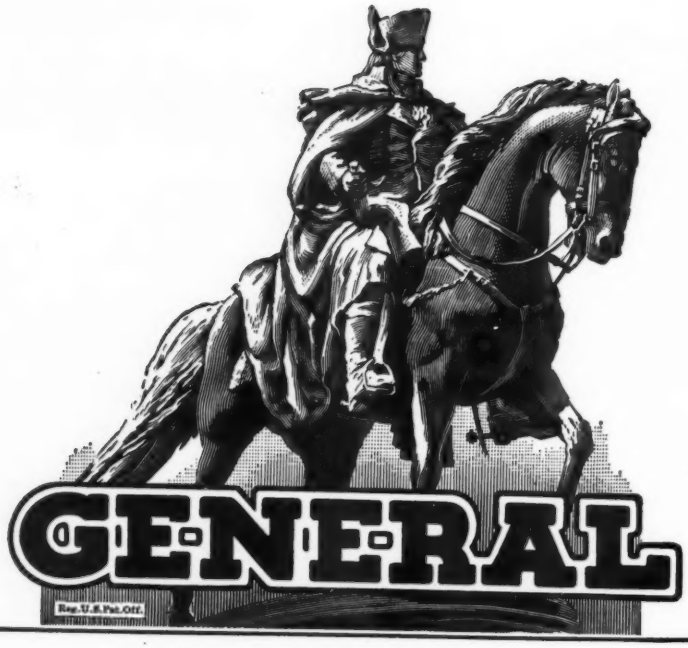
Bulletin 963 features the CASH STANDARD Type 100 Series of Super-Sensitive Controllers — various types for automatically operating valves, dampers, rheostats, stokers, pulverizers, fans, and other apparatus. 16 pages filled with descriptions and applications.



Bulletin 968 features the CASH STANDARD Type 34 Pressure Reducing Valve — direct operated — direct acting for handling steam, hot water, cold water, air, oil, brine—and most liquids and gases except some injurious chemicals. Illustrates and describes the different styles available and tells about their applications. Three pages of capacity charts.



Bulletin 956 features the CASH STANDARD Type 4030 Back Pressure Valve — designed to automatically maintain a constant pressure in the evaporator corresponding to a constant temperature desired. Shows an Ammonia and Freon Gas Capacity Chart based on ABSOLUTE pressures.



RODA

High grade gas, by-product and steam coal from Wise County, Va., on the Interstate Railroad.

DENDRON

High grade gas, by-product, steam and domestic coal from Wise County, Va., on the Interstate Railroad.

STONEGA

High grade, high volatile steam and by-product coal from Wise County, Va., on the Interstate Railroad.

PREMIX STOKER

A laboratory controlled product blended to meet exacting stoker requirements. From Wise County, Va., on the Interstate Railroad.

GLENBROOK

The Premium Kentucky Splint unmatched for domestic use—now under development in Harlan County on the L. & N. Railroad.

COKE

Roda and Stonega from Wise County, Va.

CRITERION COAL

High grade gas, by-product, steam and domestic coal—Pittsburgh seam from Irwin Basin, Westmoreland County, Pennsylvania, on the Penna. Railroad.

CROZER

Genuine Pocahontas from McDowell County, W. Va., on the Norfolk & Western Railroad.

LYNCO

High fusion coking coal for by-product, industrial stoker and pulverizer use from Wyoming Co., W. Va., on the Vgn. Ry.

Old Kentucky

Hazard No. 4 and No. 7 steam and domestic coal from Wiscoal, Knott County, Kentucky, on the L. & N. Railroad.

ANTHRACITE

Hazle Brook and Raven Run Premium Coal.

Our personnel with the experience gained through long and varied marketing activity assures effective servicing of any fuel requirement.

General Coal Company

123 SOUTH BROAD STREET, PHILADELPHIA 9, PA.

BRANCHES:

BLUEFIELD, W. VA. BOSTON BUFFALO CHARLOTTE, N. C.
CINCINNATI NEW YORK NORFOLK PITTSBURGH

diesel D4 tractor. 16-page booklet, Form No. 11620, entitled "Industrial Uses for Caterpillar Diesels," discusses functional efficiency of track-type tractors, diesel engines and diesel electric sets operating both as prime and auxiliary units in industries.

MECHANICAL TRANSMISSION

33 VARIABLE-SPEED MOTORS—U. S. Electrical Motors, Inc, 200 E Slauson Ave, Los Angeles 54, Calif. 16-page bulletin on the Varidrive shows how a variable-speed motor can be applied to countless operations to reduce operator fatigue and increase production.

34 DRIVE CHAINS—Jeffrey Mfg Co, Columbus 16, Ohio. 56-page catalog No. 808 presents complete line of Jeffrey steel thimble roller drive chains in pitches ranging from 1½ to 6 in., and in straight and offset side bar types.

35 SPEED REDUCER — Winfield H Smith Corp, Springville, Erie County, N. Y. 4-page folder discusses the new Winsmith helical gear differential speed reducer. Photos of various models are included.

36 OVERRUNNING CLUTCH—Dept 22, Morse Chain Co, 7601 Central Ave, Detroit 8, Mich. 16-page catalog No. C11-48 gives construction, development and working principle of the new Morse-Formsprag full complement over-running clutch.

37 CAST IRON PULLEYS — Pyott Foundry & Machine Co, 328 N Sangamon St, Chicago 7, Ill. 10-page catalog contains new list prices and a description of the various types of pulleys that can be produced.

38 GEAR LINE—American Gear & Mfg Co, 5900 Ogden Ave, Chicago 50, Ill. Folders describe and list discount schedules of American gears for catalogs No. 50, 300 and 340.

METERS AND INSTRUMENTS, MECHANICAL

39 COMBUSTION TEST SETS — F W Dwyer Mfg Co, 317 S Western Ave, Chicago 12, Ill. 4-page bulletin No. 220 depicts various components of Dwyer combustion test sets and tells how they are used.

40 CONCENTRIC ORIFICES AND FLOW NOZZLES—Hagan Corp, 323 Fourth Ave, Pittsburgh 19, Pa. 10-page bulletin No. T-100-M, entitled "Capacity Data for Concentric Orifices and Flow Nozzles," presents a convenient method for approximating the orifice or nozzle throat to pipe diameter ratios required for satisfactory fluid meter installations.

41 BOILER WATER-LEVEL CONTROL — Northern Equipment Co, Erie, Pa. 8-page bulletin No. 485 discusses boiler water level control at Scovill Mfg Co. Photos, diagrams and tables are included.

42 FLOW-RATE KIT — Brooks Rotameter Co, Box No. B-19848, Lansdale, Pa. Bulletin No. 5-5-48 describes multirange flow rate kit for research laboratory and pilot plant.

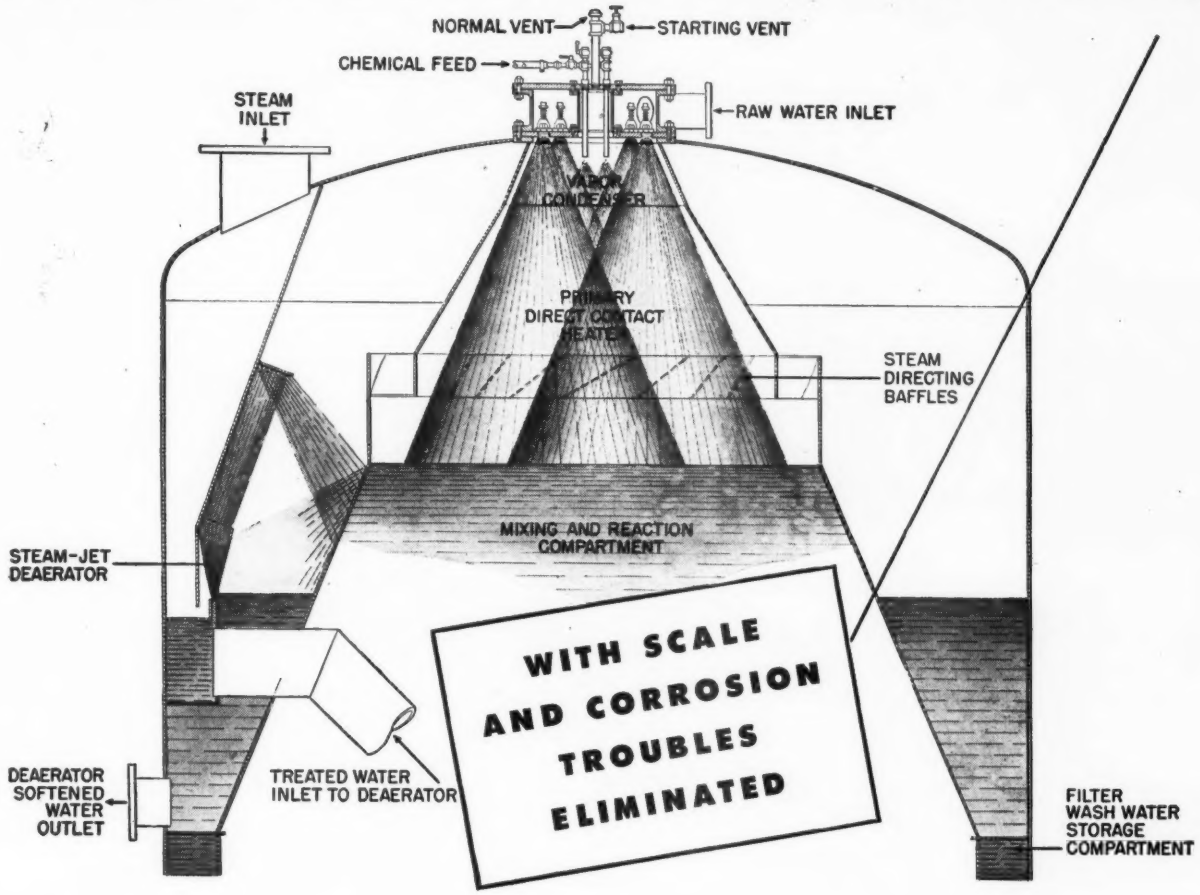
43 HAND TACHOMETERS—Metron Instrument Co, 432 Lincoln St, Denver 9, Colo. 4-page bulletin No. 103 covers electric hand tachometers and accessories for speed measurements.

PIPING, FITTINGS, VALVES AND SPECIALTIES

44 STAINLESS PIPING SYSTEMS — Taylor Forge & Pipe Works, P O Box 485, Chicago 90, Ill. 4-page bulletin No. 483 on flanged piping includes drawings, dimensions and prices of new type fittings and flanges, available in Stainless 304, 347, 316 and other materials.

45 BLOWOFF VALVES — Everlasting Valve Co, 49 Fisk St, Jersey City 5, N. J. 4-page bulletin No. E-120 presents different types of Everlasting valves in tabular form so that correct selection of the valve can be quickly determined for any desired pressure, method of operation, operating conditions and ASME code requirements.

NOW...water softening



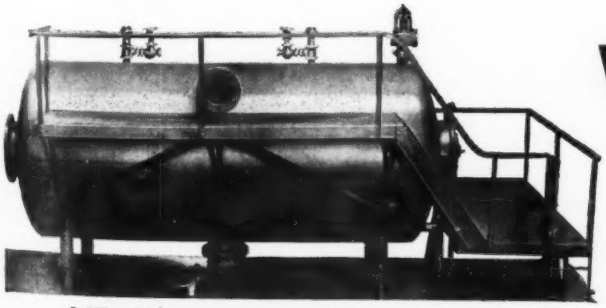
The tubular vent condenser which Worthington Research and Engineering previously eliminated on deaerators is now no longer a necessary part of the water softener!

Worthington research has developed a hot process deaerating softener in which the displacement flow path for steam is so designed that non-condensibles are separated from the water and concentrated for removal with negligible thermal loss—*without the need of tubular vent condenser.*

This means: no more scaling and corrosion of tubes, water inlet piping and spray valves . . . no more loss of operating efficiency due to scale . . . no more maintenance costs for scale removal.

It's another Worthington achievement in water softening which . . . like the already-established filter wash water storage compartment . . . proves again that *there's more worth in Worthington!*

Write for further information on Worthington Water Softeners and Deaerators, addressing nearest district office or Worthington Pump and Machinery Corporation, Steam Power Division, Harrison, N. J.

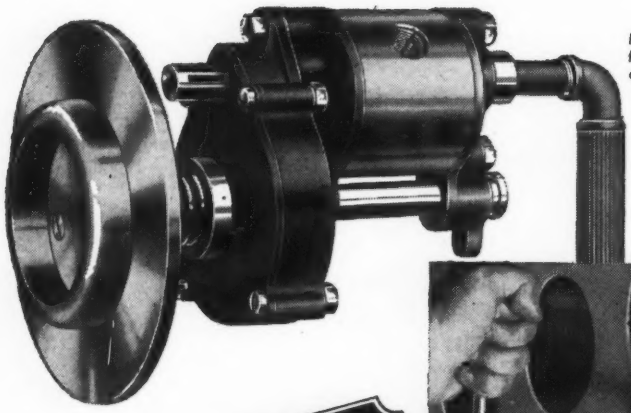


A Worthington deaerator *without vent condenser*

WORTHINGTON

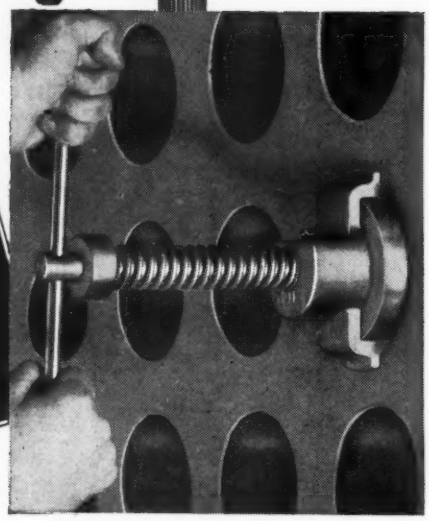
WATER SOFTENERS

J8-2



Roto Reseating Machine for boiler headers with outside caps

Clean boiler caps and headers FAST



Illustrating ease of operation of Roto Hand-hole Seat Scraper.

Tight, leakproof joints between boiler headers and caps are quickly and easily obtained with specially designed Roto tools. These tools have been used widely for many years, and are sold on a money-back guarantee of satisfaction.

for OUTSIDE CAPS

Scale, rust or other adhering matter is removed with a Roto Reseating Machine, assuring a smooth, true fit. This air-driven machine cleans headers and caps with an abrasive cloth disk fastened to a flat surface plate whose pilot ring accurately centers the disk on the gasket seat. Caps are cleaned by securing the machine in a vise and holding the cap against the disk. Three pilot rings are furnished, one for the header and two for cleaning both seats of the caps.

The inexpensive abrasive disk is easily replaceable when worn, assuring a true grinding surface at all times. The machine is light (10 lbs.) and convenient to handle. It develops 1 hp at 5,000 rpm, and is geared down 5 to 1 to provide ample torque.

Send for details and prices.

for INSIDE CAPS

Roto Hand-hole Seat Scrapers can be furnished to clean standard round and oval holes. This simple, hand-operated tool is equipped with retractable knives, mounted on the end of a revolving spindle having a bearing in a substantial yoke. An adjustable spring automatically maintains tension on the knives, sufficient to remove all foreign matter, but not enough to cut the metal. A few turns to the right and the job is done. A half turn to the left releases the machine. Write for bulletin and prices.

MAKE OF BOILER	TUBE SIZE	OPENING
Babcock & Wilcox	4"	Oval
B. & W. #40 Header	3¼"	Oval
B. & W. #41 Header	2"	Oval
B. & W. Superheater	2"	Round
Babcock & Wilcox	4 13/16 x 5"	Square
Casey Hedges	4"	Oval
Casey Hedges	3½"	Oval
Combustion Eng.	3"	Round
Edge Moore	4"	Oval
Franklin	4"	Round
Geary	4"	Oval
Heine	3½"	Oval
Heine	3½"	Round
Keeler	4"	Round
Keeler	4"	Diamond
Murray	4"	Oval
Murray	3½"	Oval
Oil City	4"	Oval
Oil City	3½"	Oval
Union Iron Works	4"	Pear Shpd.
Walsh & Widener	4"	Oval

ELLIOTT COMPANY-ROTO DIVISION

153 Sussex Avenue Newark 1, N. J.

46 ADJUSTABLE PORT VALVES — North American Mfg Co, Cleveland 4, Ohio. Bulletin No. 1 describes construction and operation of North American adjustable port valves.

47 RELIEF VALVES—Associated Valve & Engrg Co, 1150 W Marquette Rd, Chicago 21, Ill. 4-page bulletin gives construction of stainless-steel safety and relief valves. List prices are included.

OTHER EQUIPMENT

48 COMPANY DEVELOPMENT—Farrel-Birmingham Co, Inc, Ansonia, Conn. 32-page centennial booklet gives historical data as well as present-day status of Farrel-Birmingham Co. This booklet commemorates the 100th anniversary of the founding of the plant.

49 COMPANY HISTORY — Goulds Pumps, Seneca Falls, N. Y. 4-page article, entitled "Goulds Centennial Year," covers history of this pump company.

50 PORTABLE COMPRESSORS — Ingersoll-Rand Co, 11 Broadway, New York 4, N. Y. 8-page booklet, Form No. 145, describes Pac-Air, a recent addition to Ingersoll-Rand's line of portable compressors.

51 SHELL AND TUBE HEAT EXCHANGERS—Ross Heater & Mfg Co, 1407 West Ave, Buffalo 13, N. Y. Bulletin No. 4300 discusses complete line of Ross shell and tube heat exchangers and allied equipment for all industries.

52 CONDENSER AND HEAT-EXCHANGER TUBES — Scovill Mfg Co, Waterbury, Conn. Literature describes and give base prices of Scovill condenser and heat-exchanger tubes.

53 HIGH-TEMPERATURE INSULATION—Forty-Eight Insulations, Inc, Aurora, Ill. 24-page catalog presents group of high-temperature industrial insulations. Charts and illustrations are given on conductivity and installation of plastic and block insulations offered by the company.

54 INSULATION TESTERS — Herman H Sticht Co, 27 Park Pl, New York 7, N. Y. 4-page bulletin No. 450 describes latest addition to Sticht line of Megohmer insulation testers, the new Minor Megohmer.

55 VOLT-OHM-MILLIAMMETER — Simpson Electric Co, 5200 W Kinzie St, Chicago 44, Ill. 28-page operator's manual gives specific technical information on the Simpson Model 221 volt-ohm-milliammeter.

56 GAS-BURNING DIESELS — Nordberg Mfg Co, Milwaukee 7, Wis. 8-page bulletin No. 106-A, entitled "Nordberg Gas Burning Diesels," discusses 2-cycle Duafuel engines. This bulletin contains a 5-color drawing of the schematic arrangement of gas details and piping of Duafuel diesel engines.

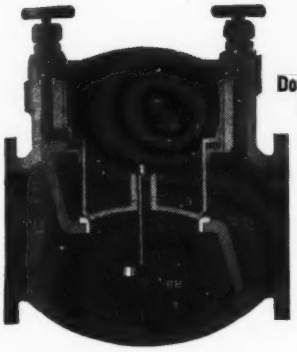
57 COMPANY LINE—Cooper-Bessemer Corp, Mt. Vernon, Ohio. Folder covers entire Cooper-Bessemer line, including diesel and gas engines, compressors, pumps and allied equipment.

58 TURBINE VANE PUMPS—Peerless Pump Div, Food Machinery Corp, 301 West Ave 26, Los Angeles 31, Calif. 4-page bulletin No. B-2200 describes application of turbine vane pumps to handling of liquefied petroleum gasses.

59 ION EXCHANGERS — Resinous Products & Chemical Co, 222 W Washington Sq, Philadelphia 5, Pa. 24-page booklet gives a description of how ion-exchange process works, chart and tabular presentations of operational data, concise application information, a glossary of 85 terms and a complete bibliography.

60 INDUSTRIAL WATER TREATMENT—Bird-Archer Co, 400 Madison Ave, New York 17, N. Y. 20-page booklet discusses industrial water treatment problems and modern methods of solving them. Complete Bird-Archer 8-point treatment system is described.

61 ARC-WELDING ELECTRODE — Wilson Weader & Metals Co, 60 E 42nd St, New York 17, N. Y. 40-page catalog contains 50 photos and diagrams, an electrode selector chart and complete details on all electrodes in Wilson line.



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Double Cushioned
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Dependability

proven in the

POWER PLANTS

of

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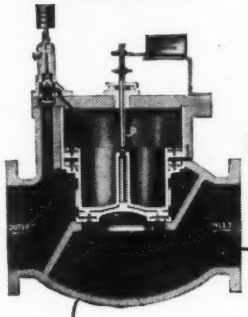

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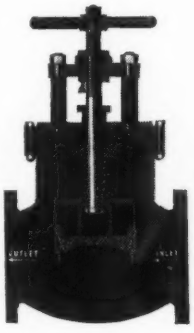

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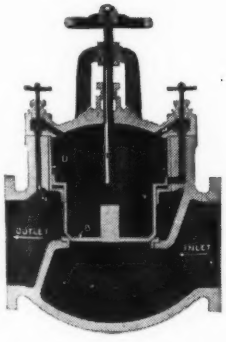
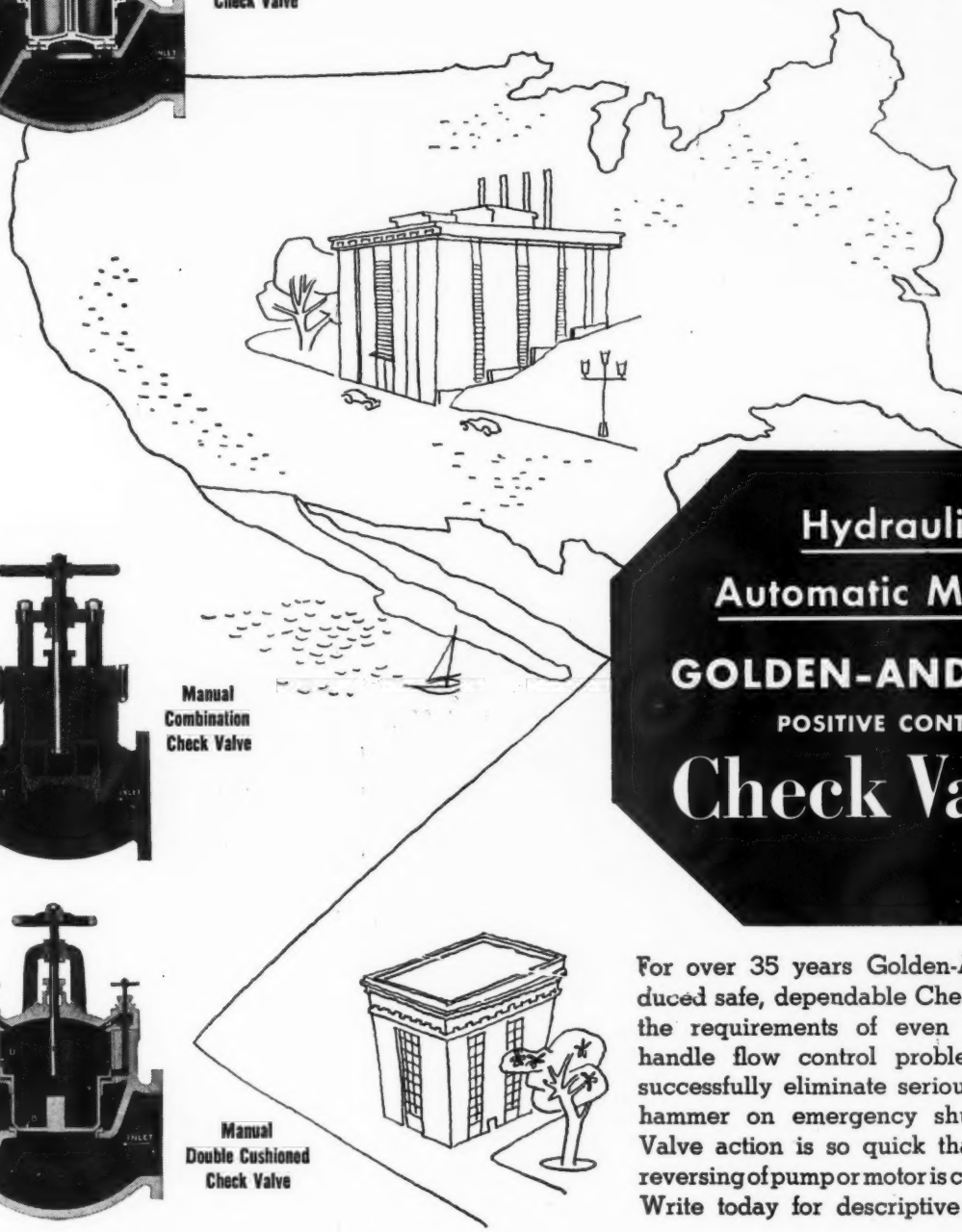


Manual
Double Cushioned
Check Valve



Hydraulic
Automatic Manual

GOLDEN-ANDERSON

POSITIVE CONTROL

Check Valves

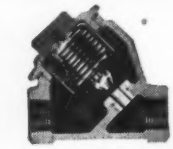
For over 35 years Golden-Anderson has produced safe, dependable Check Valves to satisfy the requirements of even the most hard-to-handle flow control problems. These valves successfully eliminate serious surge and water hammer on emergency shutdown of pumps. Valve action is so quick that all possibility of reversing of pump or motor is completely removed. Write today for descriptive technical catalog.

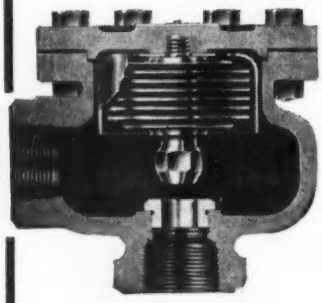
GOLDEN-ANDERSON *Valve* **Specialty Company,** KEENAN BUILDING, PITTSBURGH 22, PA.

We Invite You TO TEST NICHOLSON STEAM TRAPS FOR

LOWEST STEAM LOSS

LARGEST CAPACITY





See why an increasing number of America's leading plants are standardizing on Nicholson traps. Test trap gladly sent.

Comparative tests by large trap users show: record low for steam waste; 2 to 6 times average drainage capacity; operate on lowest temperature differential; no freeze-ups; greater simplicity (fewer spare parts to stock). 5 types for every purpose; size ¼" to 2"; pressure to 225 lbs.

Control Valves for All Mediums

For steam, water, air, gas, oil; and for all types of operation—lever, foot, solenoid, motor. Choice of 6 metal combinations to meet specific needs. Pressures to 5000 lbs. CATALOG 546.

BULLETIN 1047
or see Sweet's

W. H. NICHOLSON & CO.

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You can cut clean gaskets in a jiffy . . . with the

ALLPAX GASKET CUTTER

Here's the tool to save money and time . . . inexpensive . . . fast . . . foolproof. Anyone can cut clean gaskets with it in a fraction of the time required by old-fashioned hand methods.

Cuts gaskets from 1" to 36" diam. in asbestos sheet, rubber, duck, canvas, cork, felt, cardboard or any other gasket material. Pays for itself.

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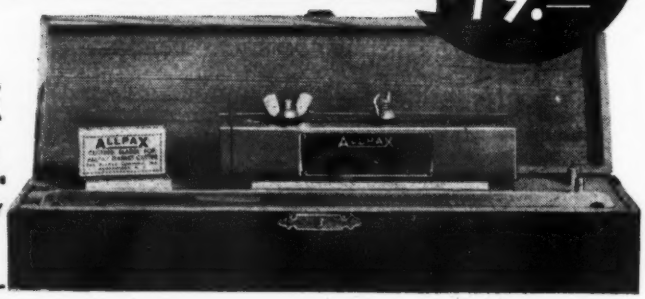


THE ALLPAX CO., INC.
MAMARONECK
N. Y.

(*Continued from page* 182)

grams should fall near the counter pressure line by end of stroke.

Excess release pressure as on card will oppose rather than assist compression. To remedy, eccentric should be advanced to speed opening of steam and exhaust valves, making release and compression earlier. If this results in too much lead, steam-valve rods can be adjusted so these valves have more lap over their ports.

In diagram marked crank-end, actual expansion line rises considerably above the theoretical curve. This indicates a leaky valve, which allows steam to enter after cutoff. Although an expansion line that closely follows the theoretical curve is not positive indication that valves and piston are tight, steam may leak in and out of cylinders at the same time, producing a card that appears satisfactory. I advise checking all valves for tightness, also steam cylinder, piston and rings.

Clearance should be checked and kept low, since smaller clearance results in greater pressure due to the smaller final volume obtained.

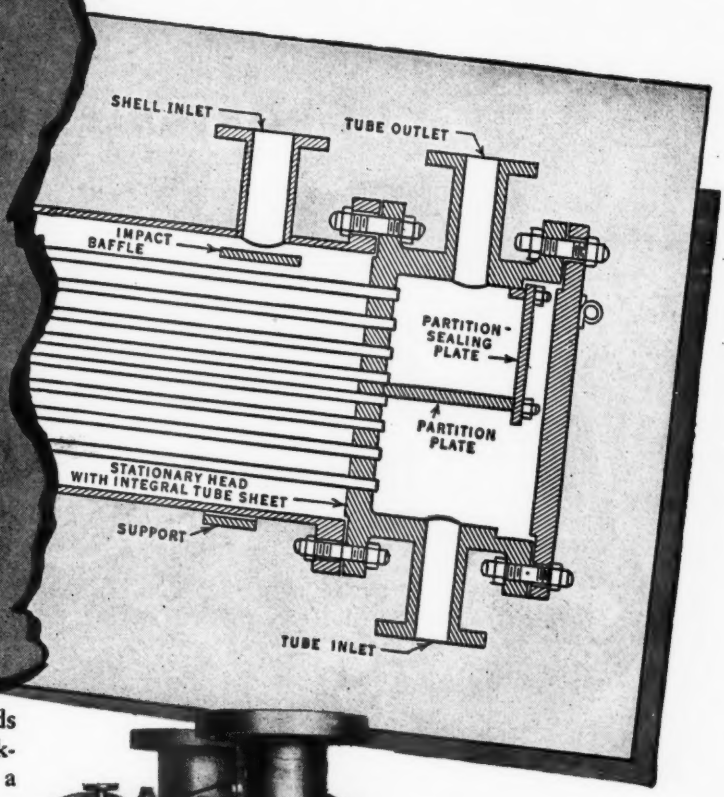
It is good practice to give more lead to an engine at bottom center in compensation for the angularity of connecting rod, weight of moving parts and reduced area of piston because of the piston rod.—**Paul Dovenar, Brooklyn N. Y.**

Use Dial Indicator To Check Bearings

At present, I am in charge of the same type compressor engine. And by coincidence it has the same defect, having a heavy thud at bottom center. Plans are now under way to correct the trouble.

Records of this unit installed in 1892 show main bearing trouble during its life and replacement of one broken crankshaft. Easiest and most accurate way to check radial play of main bearings is with a dial indicator. Attach indicator to lower half of bearing with a stiff bracket that holds indicator over top center of shaft. Try the indicator for maximum number of revolutions needle will turn. Set indicator so hand moves up .010 to .015. When point rests on the shaft, so any movement of shaft will not damage the instrument by over-travel, set zero on the dial indicator. Start unit up and gradually increase speed noting movement of needle to the point where maximum pound is produced. Movement of indicator hand shows rise and fall of shaft during each revolution. This method works well on slow-speed engines.—**S C Page, Buffalo, N. Y.**

Leakage Between Passes Prevented in G-R FEEDWATER HEATER



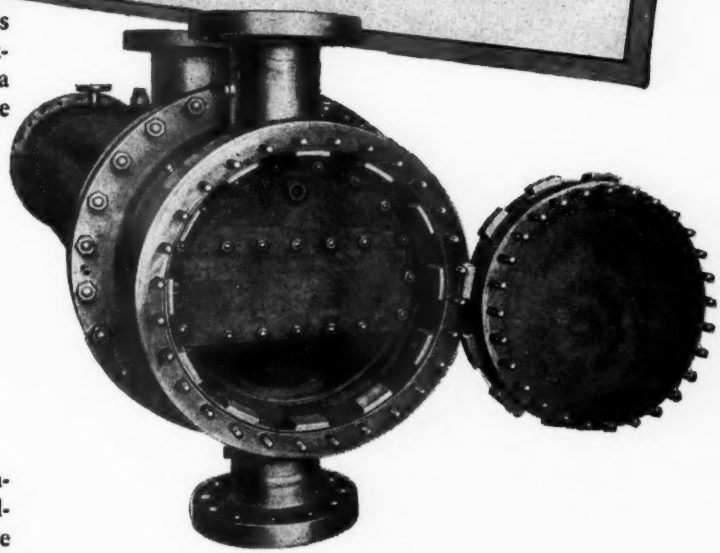
The partitions between passes in the water heads of feedwater heaters are a fruitful source of leakage that can't be detected. The head cover is a literal "iron curtain" behind which you can't see short-circuiting of water between passes.

●

Griscom-Russell offers designs of feedwater heater stationary and floating heads in which this inter-pass leakage CAN'T occur. How? By making the differential in water pressure between the passes help to keep the partition joints *tight* instead of tending to force them apart.

●

The sketches tell the story. It's one of many instances of G-R pioneering in the design of feedwater heaters. Write for bulletin describing these heaters and their many distinctive features that give you benefits you can't obtain in other feedwater heater designs.



THE GRISCOM-RUSSELL CO.
285 MADISON AVENUE, NEW YORK 17, N. Y.

GR-201

GRISCOM-RUSSELL

Pioneers in Heat Transfer Apparatus

Ultra Sensitivity

IN PORTABLE FORM

Designed for a wide variety of laboratory measurements, especially those where high sensitivity and a long scale arc are required. Electrostatically and magnetically shielded, Model 622 is ideally suited for precise measurements of potential and current at the very low energy levels frequently encountered in nuclear physics, electronics and electro-chemical research. Microammeters, milliammeters, millivoltmeters and voltmeters are available in single and multi-range D-C types; milliammeters and voltmeters in thermo and rectifier types for RF and A-C.

Complete information on Model 622 is available from your nearest WESTON representative, or by writing . . . WESTON Electrical Instrument Corporation, 617 Frelinghuysen Avenue, Newark 5, N. J.

WESTON *Instruments*

ALBANY • ATLANTA • BOSTON • BUFFALO • CHARLOTTE • CHICAGO • CINCINNATI • CLEVELAND • DALLAS • DENVER • DETROIT • HOUSTON • JACKSONVILLE
KNOXVILLE • LITTLE ROCK • LOS ANGELES • MERIDEN • MINNEAPOLIS • NEWARK • NEW ORLEANS • NEW YORK • PHILADELPHIA • PHOENIX • PITTSBURGH
ROCHESTER • SAN FRANCISCO • SEATTLE • ST. LOUIS • SYRACUSE • TULSA • IN CANADA, NORTHERN ELECTRIC CO., LTD., POWERLITE DEVICES, LTD.

New Equipment

(*Continued from page* 206)

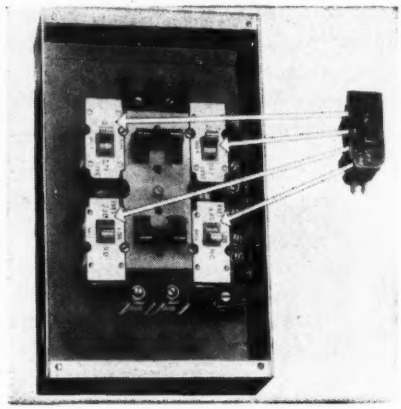
diameter sheave is quiet in operation, dynamically balanced, and may be adjusted with ease.

The unit is available with two and three grooves. Sheave has pitch diameter that varies from 5.25 to 10.0 in. This wide range provides four to five times the speed variations available with standard adjustable-diameter sheaves. **American Pulley Co, 4200 Wissahickon Ave, Philadelphia 29, Pa.**

Oil Burner E393

WIDE-RANGE, mechanical fuel-oil atomizer has a capacity range of 10 to 1 without returning or recirculating oil when original oil supply is at 300 psi (150 ssu maximum viscosity). A manual or automatic adjustment of a handwheel gives variable fuel output.

Use of constant oil pressure produces uniform high-quality atomization, says the manufacturer. Greater load ranges are possible with higher oil pressures. **Engineer Co, 75 West St, New York 6, N. Y.**



Circuit Breaker E394

TYPE MB4 circuit breaker consists of a double polarity, 4-pole basic unit with provision to receive four additional single-pole *Ad-On* units. The *Ad-On* units are plugged in on main terminals, allowing additional circuits to be added as needs require.

The multibreaker may be used for direct switching of lighting and appliance circuits, as well as to provide general circuit protection. Single-pole units are calibrated 15, 20, and 30 amp, while double-pole breakers are rated at 40 and 50 amp. Both thermal and magnetic elements provide tripping action. **Square D Co, 6060 Rivard St, Detroit 11, Mich.**

Wire Insulation E395

RUBBER INSULATION whose resistance increases when soaked in water is now available as wire insulation for use underground and in wet locations. It is particularly suit-

Klipfel

AUTOMATIC REGULATING VALVES

NOT LOOKING FOR TROUBLE ...BUT ABLE TO TAKE IT!

● Yes, Klipfel Float Valves are dependable; on the job at all times, assuring reliable constant liquid level control. Illustrated is type No. 77, especially recommended wherever a tight-closing float valve is required for an open tank, supplied with water at low or high pressure. Also available as a lever valve, No. 773.

Other types of float valves, single or double seated, for other uses, are described and illustrated in Bulletin No. 344. Complete with construction details, dimensions, weights, applications, etc.

Klipfel Automatic Regulating Valves are sold through wholesalers everywhere.

KLIPFEL MANUFACTURING COMPANY
Hamilton, Ohio

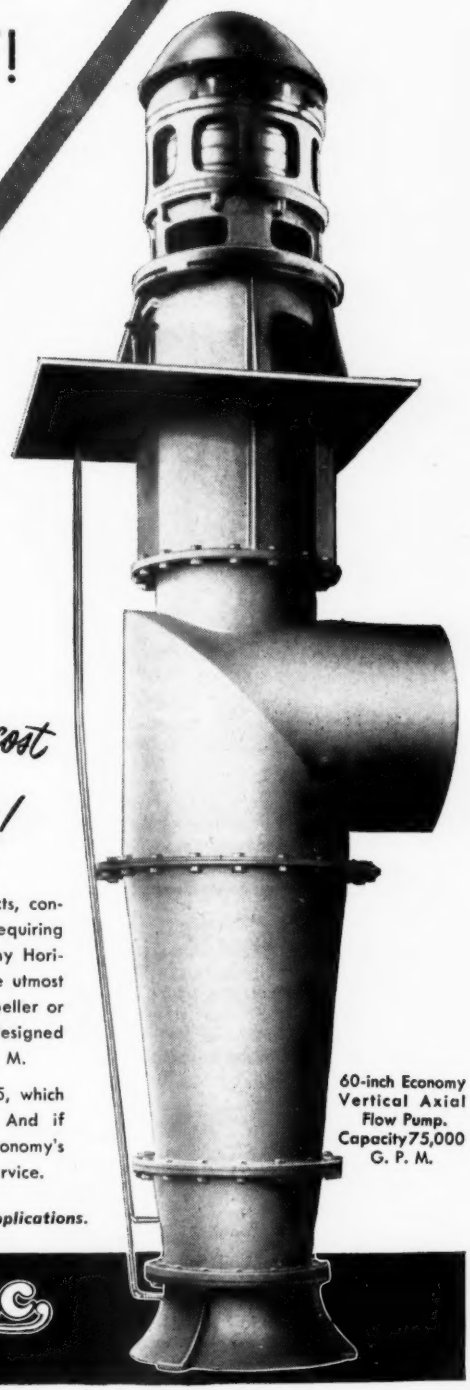
Write Dept. BC-10 today, for your copy of Bulletin No. 344.

ECONOMY... for low cost BIG VOLUME pumping!

● For drainage, irrigation, flood control projects, condenser water circulation, and other services requiring the pumping of large volumes of water, Economy Horizontal and Vertical Axial Flow Pumps afford the utmost in low cost operation. Available with either propeller or mixed flow runners. Heads from 5 to 70 feet, designed to handle capacities from 500 to 150,000 G. P. M.

Address Dept. BC-10 for Catalog No. G845, which offers complete information on standard units. And if your problem is a special one, remember that Economy's staff of hydraulic engineers is always at your service.

Centrifugal, axial and mixed flow pumps for all applications.



60-inch Economy Vertical Axial Flow Pump. Capacity 75,000 G. P. M.

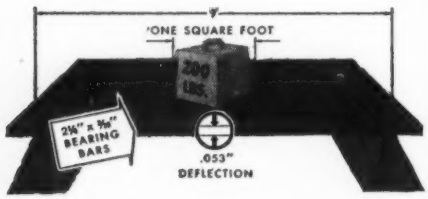
Economy Pumps Inc.
HAMILTON, OHIO

For STRENGTH specify

TRI-LOK

RECTANGULAR

OPEN STEEL FLOORING



The locked-in strength of Tri-Lok enables it to stand up under heavy loads—even on long spans. No rivets, bolts, or welds are used in the construction of Tri-Lok; this feature eliminates the possibility of loose joints.

Tri-Lok is also available in Diagonal, or Super-Safety U-type Flooring, and in Stair Treads of all types. Write for Bulletin KM 1140.

DRAVO CORPORATION

National Distributor for the Tri-Lok Company

Dravo Bldg., Pittsburgh 22, Pa.

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DRAVO

Makes ALL VALVES *INSTANTLY* Accessible

CONTROL FROM THE FLOOR

● **Instant, handy, safe control of overhead and other out-of-reach valves. Eliminate danger to employees; banish the stepladder. Now — install valves anywhere they should be, regardless of accessibility.**

Inexpensive BABBITT Sprocket Rims fit all types and makes of valves, with either rising or non-rising stems. Installed quickly by clamping directly onto hand wheel of valve. Eliminates makeshift apparatus and specially-made chain wheels.

● Ten standard sizes take care of all valve wheels from 2 to 30 inches in diameter.

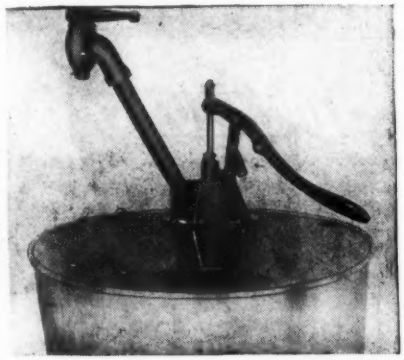
● *Request Catalog Bulletin P, prices, name of local distributor:*

Babbitt Adjustable SPROCKET RIM with Chain Guide

BABBITT STEAM SPECIALTY COMPANY

New Bedford, Mass., U.S.A.

able for underground lead-ins and wiring for damp basements. In recent tests *Laytex RUW* wire insulation was immersed in water at a temperature of 122 F for 24 weeks. At the end of this time the insulation resistance showed an increase from 500 to 2400 megohms per 1000 ft of wire. **U. S. Rubber Company, Rockefeller Center, New York, N. Y.**

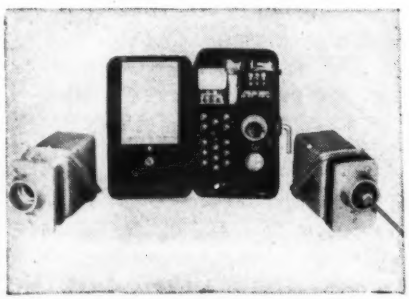


Drum Pump E396

SELF-PRIMING DIAPHRAGM DRUM PUMP for oils, alcohol, paint thinners and other volatile liquids has positive shutoff valve to prevent evaporation. Diaphragm made of heavy-cord fabric vulcanized between synthetics that are not affected by oil, alcohol and most other fluids. Spout makes it easy to fill measuring can and containers. Automatic drain-back drains hose and pump when handle is lifted. **General Scientific Equipment Co, 2700 W Huntingdon St, Philadelphia 32, Pa.**

Hard-facing Electrodes E397

COATED TUBULAR ELECTRODES are steel tubes in which a hard-surfacing alloy is held. Alloy deposits into a molten crater where it bonds into a tough alloy matrix or it is alloyed by heat of the arc with the bare metal. *Tungweld C* has coarse tungsten-carbide particles within the tube; *Tungweld F* has fine tungsten-carbide particles within the tube. Both are available in 14 in. length, ⅛ in. size, packed in 5 lb containers. **Lincoln Electric Co, Cleveland 1, Ohio.**



Flame-Failure Device E398

GAS-OIL CONVERSION BURNERS can select one of two *Fireye* models *FF-2* and *FF-6*. *FF-2* applies to oil-burners using gas as an alternate fuel. A photoelectric scanner monitors main oil flame and gives instantaneous shutdown on flame failure. A pro-

LOOK TO THE LEADER FOR THE

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PEERLESS DEEP WELL TURBINE PUMP FOR SMALL DIAMETER WELLS

Squarely meets the need for turbine pump utility, stamina and reliability for 4" wells and larger

Here is the Peerless pump that successfully and completely fills the gap often found between domestic water systems and the larger deep well turbine pumps. The Champion is a powerful water producer from small diameter deep wells; it provides unsurpassed water lifting performance for a host of commercial and industrial uses requiring moderate gallonage and a clean water supply. Read the specifications below. If you find that the Peerless Champion turbine pump generally meets the water requirements of your business, write for full details, described and illustrated in a new Peerless engineering Bulletin. Do it today!

PEERLESS CHAMPION SPECIFICATIONS:

CAPACITIES: Up to 5000 gals. per hour

LIFTS: Up to 200 Feet

PRESSURES: Up to 90 lbs.

DRIVES: Available with electric head, right angle geared head for use with horizontal driver or Vee-belt drive.

WATER LUBRICATED: OPEN LINE SHAFT CONSTRUCTION

FOR 4 INCH DIAMETER DEEP WELLS AND LARGER

TOP FLIGHT PEERLESS QUALITY CONSTRUCTION THROUGHOUT

WRITE FOR BULLETIN B-200

Contains complete pump description, plus valuable engineering and water pumping data. Fully illustrated.

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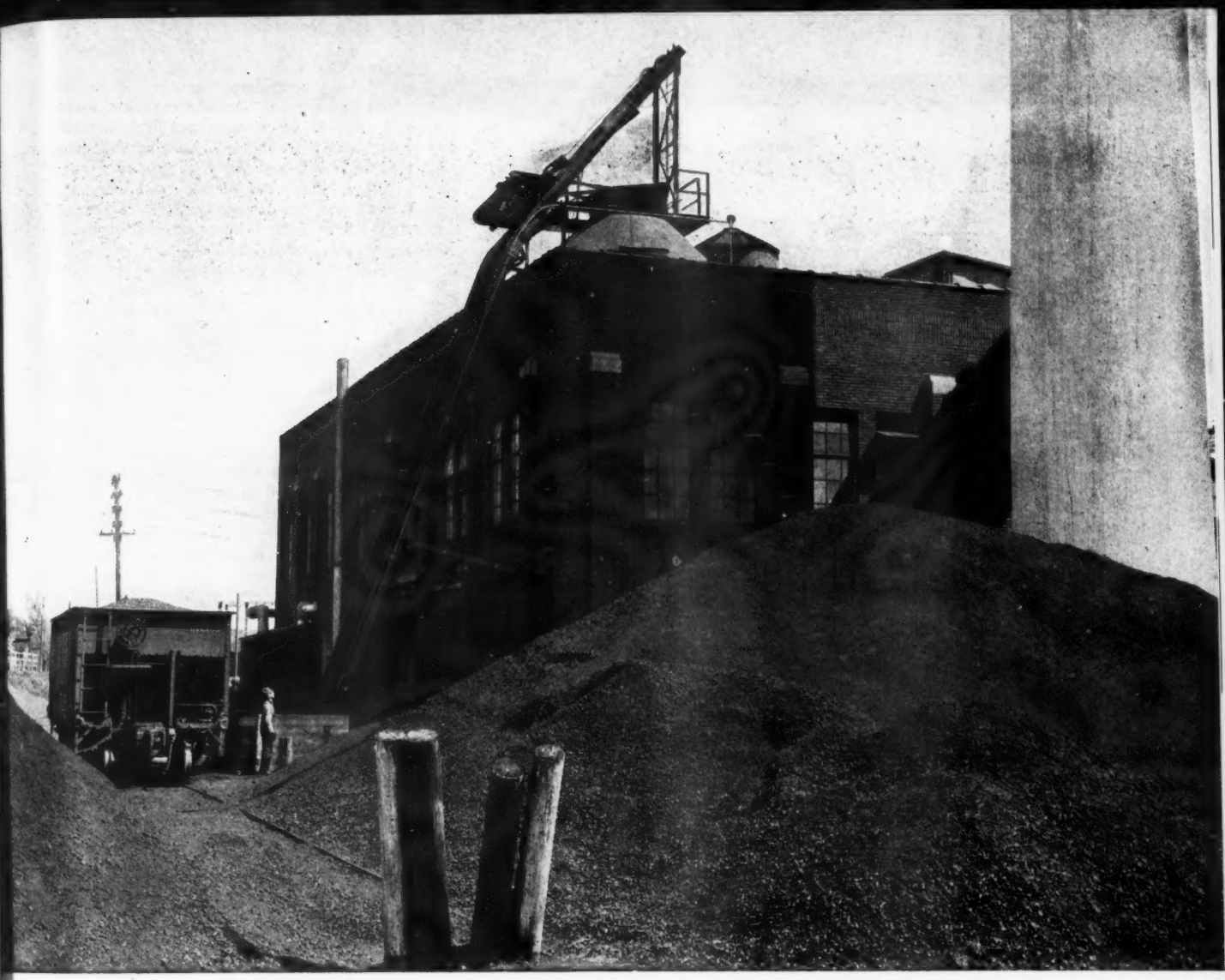
District Offices: New York 5, 37 Wall Street; Chicago 40, 4554 No. Broadway; Atlanta Office: Rutland Building, Decatur, Georgia; Dallas 1, Texas; Fresno, California; Los Angeles 31, California.



If you burn from 40 to 200 tons of coal a day

BASED on hundreds of successful industrial installations, Bartlett-Snow coal burning experts have developed —and standardized—six different coal handling equipments for use in industrial boiler plants burning from 40 to 200 tons of coal a day.

These equipments combine the best features of our best jobs. They can be installed in existing or new buildings. They are readily adaptable to a wide variety of yard and track conditions; —and offer users three outstanding advantages.

PROVEN INSTALLATION: Each of the six standard layouts represents an actual installation now in use. No experimental work is necessary. There will be a minimum of "starting-up" and "running-in" adjustments.

MINIMUM OF ENGINEERING EXPENSE: The engineering design costs of these six standardized systems have already been paid for. Consequently in buying a "standardized" system, the maximum amount of the purchasers expenditure is used for actual physical equipment.

PROMPT DELIVERY: In buying a "standardized" layout, or one with only slight alterations, the purchaser saves not only the *cost* of new engineering, but also the *time* of designing new equipment. Shop fabrication of the equipment starts quickly after receipt of the order, and the equipment is in actual operation in the purchaser's plant in the shortest possible time.

Send for a copy of our Bulletin No. 83. It describes the six standard systems in detail,— and let the Bartlett-Snow coal handling engineers work with you on your next job. The C. O. Bartlett & Snow Company, Cleveland 5, Ohio. Engineering representatives in New York, Baltimore, Detroit and Chicago.

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CLEVELAND 5, OHIO

COAL HANDLING SYSTEMS
for
CENTRAL STATIONS AND INDUSTRIAL BOILER PLANTS

Control Boiler Feed Water by

● **Here's why industrial plants, more and more, are changing to ILLCO-WAY ionXchange treated water for boiler make-up:**

1. **To prevent deposits on evaporative surfaces.**
2. **To control alkalinity.**
3. **To reduce the possibility of carry-over.**
4. **To reduce boiler blowdown.**
5. **To keep shutdowns for turbining and cleaning at a minimum.**
6. **To secure reduced-solids water at a cost comparable to softening.**

ILLCO-WAY DE-ALKALIZING EQUIPMENT assures accurate control of boiler feed waters. It removes all excessive bicarbonates and converts the remaining sulphate and chloride solids to non-scale forming salts.

On the very common high bicarbonate water, ILLCO-WAY De-Alkalizing equipment produces a feed water low in dissolved solids and free of all scale-forming properties. Controls are provided to maintain desired alkalinity.

For further information on the application of ILLCO-WAY synthetic resin technology and design developments on boiler feed water treatment, write for latest literature today.

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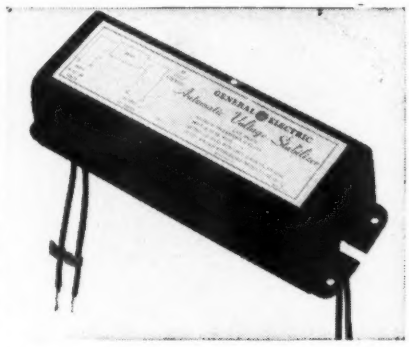
DE-IONIZING
DE-ALKALIZING
SOFTENING

ENGINEERING AND EQUIPMENT DE-IONIZERS for process water treatment and treatment of liquids and solutions other than water; waste treatment; reclamation of specific constituents. DE-ALKALIZERS: Boiler feed (external); bottling water. SOFTENERS: Industrial, domestic. FILTERS, etc

gramming control sets sequence of ignition and fuel systems. An electronic rod serves as monitor for the pilot gas flame preventing main fuel valve from opening until pilot flame is established. With gas as a main fuel a simple switching establishes the electronic rod to monitor the continuous gas flame and programming control arranges fuel and ignition system sequence. System *FF*-6 applies to gas burners where light oil is the alternate fuel. **Combustion Control Corp, 77 Broadway, Cambridge 42, Mass.**

Turboblowers E399

STURDILY CONSTRUCTED, cast-case assembly with welded-steel-plate base gives turboblower needed rigidity. Series 300 blowers come in three different types: (1) direct-connected with impellers mounted on motor shaft (2) V-belt driven where impellers mount to jackshafts and connect to various speed motors through V-belts (3) coupled-drive where impellers mounted to jackshafts connect to motors through flexible couplings. **North American Mfg Co, Cleveland 4, Ohio.**



Voltage Stabilizers E400

PROVIDING A STEADY OUTPUT of 115-v (plus or minus 1% for unity-power-factor loads) while input voltage may range between 95 and 130-v, the new units are available in 15- 25- and 50-va ratings.

Low case height and small size make them particularly suitable for shallow depth installations. Primary and secondary circuits are isolated and provided with universal type leads. **General Electric Co, Schenectady 5, N. Y.**

Oil-Immersed Rectifier E401

THESE OIL-IMMERSED selenium rectifier stacks provide isolation from dampness and corrosive vapors, greater short-time overload because of increased thermal storage, as well as protection from physical damage while in storage or during assembly.

The oil acts as an effective cooling medium while the container, which has a protective coating, resists effects of moisture, fungus, salt air and other corrosive vapors. Insulated solder lugs at one end of the rectifier provide easy, quick soldering connections. **General Electric Co, Bridgeport 2, Conn.**

(Continued on page 222)

AUSTENITIC STAINLESS STEELS MAY DO IT BETTER...

Hundreds of companies are today setting new standards of low-cost performance through the judicious use of austenitic chromium-nickel stainless steels.

By redesigning these stainless chromium-nickel alloys often permit making parts much lighter in weight, while still providing ample structural strength.

Not only can you trim bulk and deadweight by using chromium-nickel stainless . . . you can assure longer service life because these alloys are resistant to attack by nearly all oxidizing acid conditions.

In elevated temperature service they resist creep, scaling or oxidation, and at low temperatures they remain tough and offer exceptional resistance to impact.

You can draw, spin, forge, weld, solder, punch, shear or bend chromium-nickel stainless steels.

They are used where you need high resistance to corrosion and heat, along with good resistance to impact, wear and abrasion. They assure long, trouble-free performance of equipment, the appeal of beauty and durability in decorations, hygienic cleanliness as well as economy in food, drug, chemical and other process industries.

Leading steel companies produce austenitic chromium-nickel stainless steels in all commercial forms. A list of sources of supply will be furnished on request.

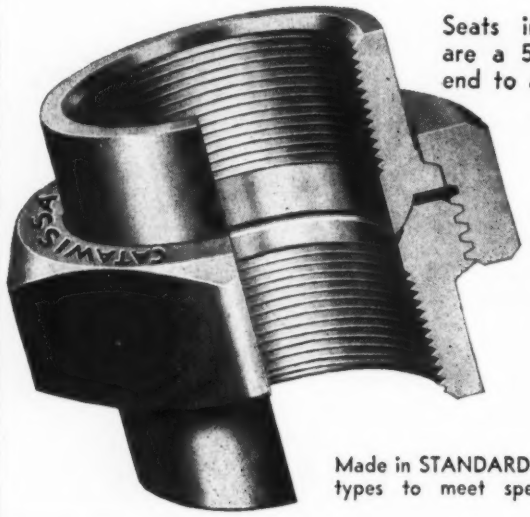
EMBLEM OF INCO SERVICE
TRADE MARK

Over the years, International Nickel has accumulated a fund of useful information on the properties, treatment, fabrication and performance of engineering alloy steels, stainless steels, cast irons, brasses, bronzes, nickel silver, cupro-nickel and other alloys containing nickel. This information is yours for the asking. Write for "List A" of available publications.

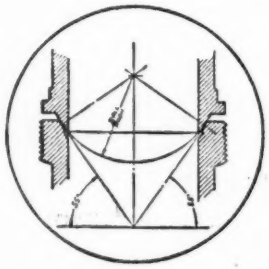
THE INTERNATIONAL NICKEL COMPANY, INC. 67 Wall St., New York 5, N. Y.

CATAWISSA UNIONS
● HOT FORGED STEEL
● STAINLESS STEEL

give you a
PERFECT SEAL
even when the pipe is not in perfect alignment!



Seats in all Catawissa Unions are a 55° angle on the female end to a BALL on the male end —assuring good, tight, leakproof joints!



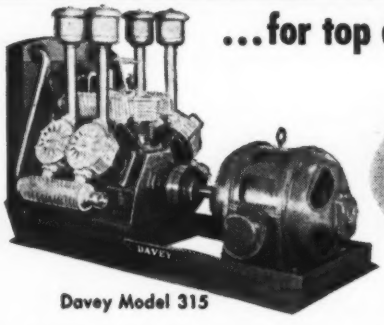
Made in STANDARD and DOUBLE EXTRA HEAVY types to meet specific pressure requirements!

Double Extra Heavy
Hot Forged Steel
SWING CHECK VALVES

write for your copy of BULLETIN 10-A

CATAWISSA VALVE & FITTINGS CO.
206 Mill St. • CATAWISSA, PA.

...for top air output *plus* economy



Davey Model 315

SPECIFY DAVEY DEPARTMENTAL *Compressors*

DAVEY DEPARTMENTAL COMPRESSORS GIVE YOU THESE ADVANTAGES

- Power savings
- Lower air losses
- Maximum air operating efficiency
- Make plant expansions easy and economical
- Eliminate shutdowns due to compressor failures
- Air cooling eliminates water bills
- Ease of installation
- Reduced maintenance and replacement expense

IN LINE with today's trend toward employment of small departmental compressors instead of one large centralized machine, Davey offers a complete line of industrial units.

These are available in 60, 105, 160, 210 and 315 c.f.m. capacities. And every Davey has GUARANTEED LIFETIME VALVES.

DAVEY COMPRESSOR CO. • KENT, OHIO

Write for Bulletin E-219

DAVEY

P&P-102

DAVEY COMPRESSOR CO. *Dealers in Principal Cities*

Turbine Pump E402

LIQUID-TRANSFER TURBINE PUMP is for industrial applications to provide 8 gpm up to 80 psi. Pump has all bronze construction with stainless-steel shaft running in double-ball bearings. Single multivaned impeller develops high pressure in single stage and will handle condensate without vapor binding. Pump is available with or without motor, base or coupling. **Roy E Roth Co, Rock Island, Ill.**

Dual-Fuel Burner E403

GAS OR OIL-FUEL BURNERS come in two models: (1) Series 113 gives a long, luminous flame built for installations requiring a uniform flame temperature. (2) Series 221 gives a short, highly stable flame designed for heating load in a relatively small space.

Both units work from an adjustable-port air valve that controls air pressure on downstream side of the valve. This pressure determines amount of oil and gas pressure by an air-oil ratio control or an atmospheric regulator. **North American Mfg Co, Cleveland 4, Ohio.**

Air-Filter E404

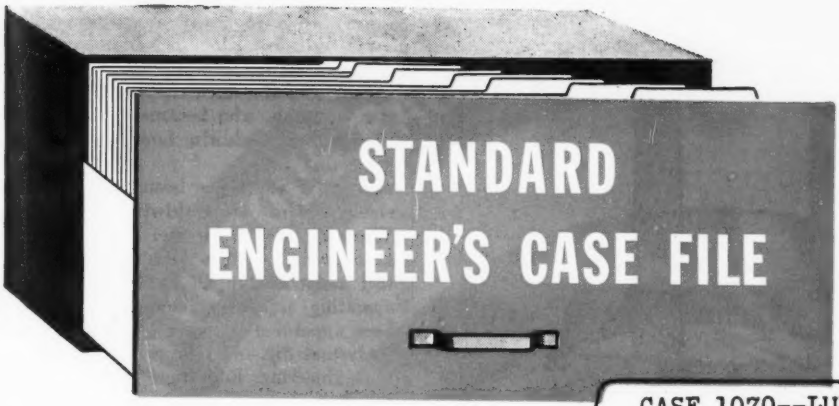
A COLLECTOR ELEMENT of electrostatically charged paper acts like an electronic precipitator without an ionizing unit. *Electro-PL* has an efficiency reported to be between the mechanical filter and the electronic precipitator. The collector element, *Airmat* paper, is a laminated-cellulose product composed of a number of plies of porous tissue-like sheets that serve as filtering media in mechanical filters. When the paper is under an electrostatic charge the plies tend to separate and each fibre is said to act as a collecting electrode. **American Air Filter Company, 215 Central Avenue, Louisville 8, Kentucky.**

Refractories E405

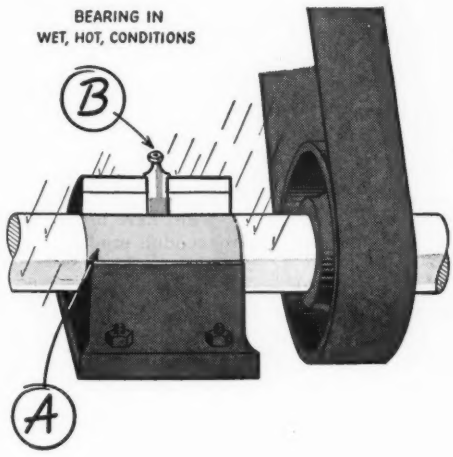
TWO CASTABLE REFRACTORIES that are reported to handle service temperatures up to 3000 F are now available. The *3X Firecrete* handles as easily as concrete, says its maker, and *3X Blazecrete* has been designed for pneumatic application with compressed air. Both refractories are fast, air-hardening ones that are adaptable to casting, gunning and troweling. **Johns-Manville Corporation, 22 East 40th Street, New York 16, N. Y.**

Paint E406

FRIGID-COAT is a plasticized base, high gloss, non-yellowing white enamel that can be applied even in zero temperature. It is designed especially for locker plants where meats and foodstuffs are stored. Coating adheres equally well to wood, metal and other surfaces. *Frigid-Coat* stops stains from bleeding through asphalt or cork insulation. **Wilbur & Williams Co, 43 Leon St, Boston 15, Mass.**



CASE 1070--LUBRICATING GREASE BEARINGS IN HEAT AND MOISTURE.



In a heavy water spray and high ambient temperatures, Calol W. P. Grease maintained good bearing lubrication for full lubrication periods. Very satisfactory on wicket gates of hydro-electric turbines, coal loader arms, hot bed and conveyor bearings in water conditions, cannery and bottle-washing equipment.

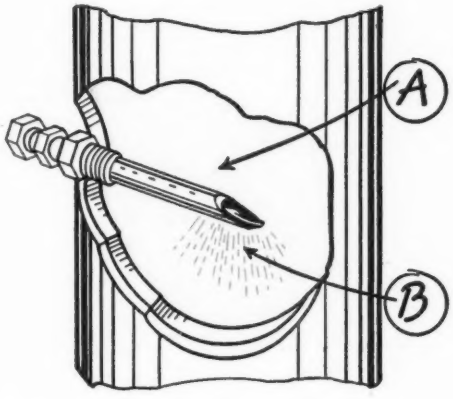
A. Extremely adherent to metal surfaces ... maintains tough lubricating film.

Calol W. P. Grease will not melt or dissolve in boiling water. Resists all heat in a peculiar manner - gradually softens over long range of temperatures instead of melting suddenly as most greases do.

B. Medium-bodied -- may be applied by grease gun or cup. Good pumpability in low temperatures.

Calol W. P. Grease contains no talc, resin, wax or other fillers.

CASE 1040--SECURING SAFE LUBRICATION IN STEAM ENGINES IN WIDE RANGE OF CONDITIONS.



LUBRICANT ATOMIZING QUILL

Compounded Calol Cylinder Oil — 155PX provided adequate lubrication with freedom from carbon in various steam engines operating with temperatures from 375° F. to 550° F. Made from 100% Pennsylvania steam cylinder oils and special acidless tallow oil. Medium viscosity grade.

A. Economical in steam conditions from saturated to moderate superheat.

B. Atomizes readily in steam.

Calol Cylinder Oil — 155PX will separate easily from exhaust steam and condensate where adequate oil separators and skimming equipment are installed.

Calol Cylinder Oil — 155PX is one of a complete line of steam cylinder and valve oils produced by Standard of California.

For additional information and the name of your nearest Distributor, write

STANDARD OIL COMPANY OF CALIFORNIA

225 Bush Street, San Francisco 20, California

The California Oil Company
Barber, New Jersey

The California Company
17th and Stout Streets, Denver 1, Colo.

Standard Oil Company of Texas
El Paso, Texas

RPM CALOL

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How to Cut Maintenance Costs 3 Ways!

GULF OIL CORP.
Port Arthur, Texas
Applier:
NOACK BROTHERS
Port Arthur, Texas

PROTECT STACK SURFACES... Subjected to every climatic change, plus extreme conditions of vibration and high temperatures, stacks are a frequent and continuing source of maintenance expense. That is until they are protected by a tough, long-lasting coating of Arco Stack Dum Dum. Then they shrug off weather and other maintenance-provoking conditions because Stack Dum Dum's elastic coating permits ample expansion and contraction to withstand heat, cold and vibration.

PROTECT BUILDING SURFACES... Where cracks appear in concrete, stucco or other masonry building surfaces, it's time to apply a thick, tough but elastic coating of Dum Dum Masonoc. This time-proved Arco product seals cracks, stops moisture seepage and prevents the need for much costly reconstruction.

PROTECT METAL SURFACES... Dum Dum for Metal protects any metal surface against the hazards of rust, corrosion, weather wear... even industrial fumes and gases.

FOR COMPLETE INFORMATION ON ALL 3 PRODUCTS—MAIL THIS COUPON TODAY

THE ARCO COMPANY
Dep P10, 7301 Bessemer Ave., Cleveland 4, Ohio

☐ Please send booklets describing Stack Dum Dum, Dum Dum Masonoc, Dum Dum for Metal.

☐ Please supply names of appliers operating in this locality.

☐ Please have sales representative call.

Name _____

Company _____

Address _____

City _____ Zone _____ State _____

SPECIFY ARCO

THE ARCO COMPANY
CLEVELAND • LOS ANGELES

APPOINTMENTS

Westinghouse Electric Corp has elected A C Monteith vice-president in charge of engineering and research. He succeeds Marvin W Smith, who became executive vice-president of Baldwin Locomotive Works.

Marvin W Smith has been made executive vice-president of **Baldwin Locomotive Works.** Lewis W Metzger has been named executive assistant to Marvin W Smith and will assist him in all phases of Baldwin's operating activities. James R Weaver has been appointed manager of manufacturing, Eddystone div, and John S Newton manager of engineering, Eddystone div.

Chain Belt Co announces opening of a new district sales office at 2900 W Clay St, Richmond 21, Va. Fred W Taylor has been made district manager of this office.

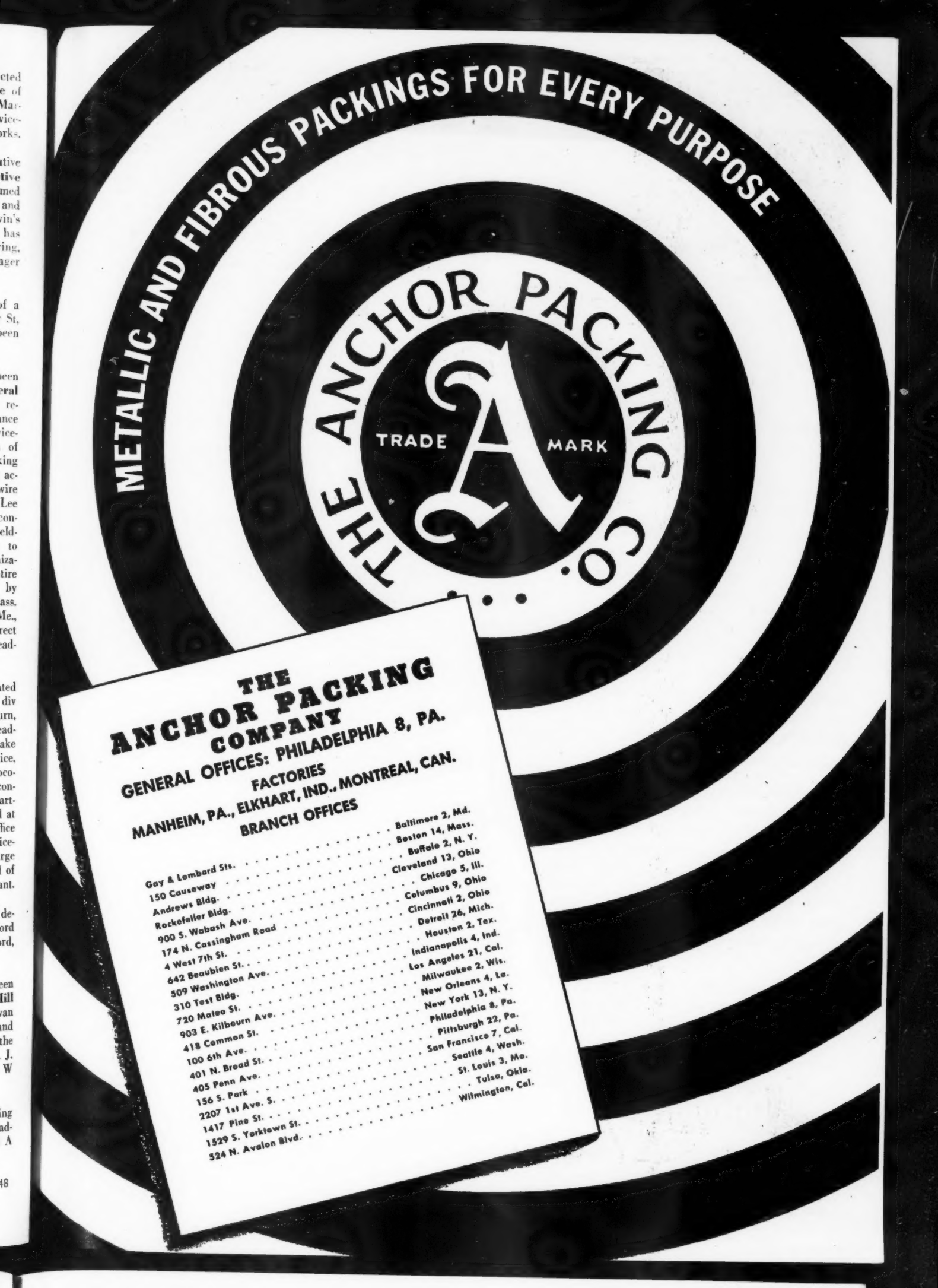
Leland W Mosher of Schenectady has been elected an assistant secretary of **General Electric Co.** In addition, Mosher will retain his position as manager of insurance div. John E N Hume, commercial vice-president, has retired after 41 years of service with the company. John G Hocking and Harold Ward have been appointed accountants for conduit products div and wire and cable div, respectively. Harold J Lee has become cashier and paymaster of construction materials dept. GE's entire welding equipment divisions have moved to Fitchburg, Mass. Under the new organization, sale of GE welding products for entire New England area will be handled by Welding Engrg Sales Corp, Boston, Mass. In addition, portions of western Mass., Me., Vt. and N. H. also will be served by direct factory sales from GE arc welding headquarters in Fitchburg.

American Locomotive Co has appointed John Thomas manager of locomotive div and William G Miller manager of Auburn, N. Y., plant. Thomas will make his headquarters in Schenectady. He will take charge of engineering, purchasing, service, renewal parts and inspection phases of locomotive div. In addition Thomas will continue to supervise manufacturing departments of locomotive div that are located at Auburn. His newly created executive office will be coordinated with activities of Vice-President W E Corrigan, who is in charge of sales activities of locomotive div, and of J J Smith, manager of Schenectady plant.

Perry R Barker has been made chief designer of power and plant dept of Stamford div of **Yale & Towne Mfg. Co,** Stamford, Conn.

W H Sullivan and N E Philpot have been appointed sales engineers for **Dean Hill Pump Co,** Indianapolis, Ind. Sullivan and Philpot will handle both sales and service functions for Dean Hill in the metropolitan area of N. Y., northern N. J. and Conn. Their N. Y. office is at 55 W 42nd St, New York 18, N. Y.

Infilco Inc has named Charles H Starling as southeast district engineer with headquarters in Decatur, Ga. to replace Fred A


METALLIC AND FIBROUS PACKINGS FOR EVERY PURPOSE
THE ANCHOR PACKING CO.
TRADE
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MARK
THE
ANCHOR PACKING
COMPANY
GENERAL OFFICES: PHILADELPHIA 8, PA.
FACTORIES
MANHEIM, PA., ELKHART, IND., MONTREAL, CAN.
BRANCH OFFICES
Gay & Lombard Sts. . . . . Baltimore 2, Md.
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Andrews Bldg. . . . . Buffalo 2, N. Y.
Rockefeller Bldg. . . . . Cleveland 13, Ohio
900 S. Wabash Ave. . . . . Chicago 5, Ill.
174 N. Cassingham Road . . . . . Columbus 9, Ohio
4 West 7th St. . . . . Cincinnati 2, Ohio
642 Beaubien St. . . . . Detroit 26, Mich.
509 Washington Ave. . . . . Houston 2, Tex.
310 Test Bldg. . . . . Indianapolis 4, Ind.
720 Matee St. . . . . Los Angeles 21, Cal.
903 E. Kilbourn Ave. . . . . Milwaukee 2, Wis.
418 Common St. . . . . New Orleans 4, La.
100 6th Ave. . . . . New York 13, N. Y.
401 N. Broad St. . . . . Philadelphia 8, Pa.
405 Penn Ave. . . . . Pittsburgh 22, Pa.
156 S. Park . . . . . San Francisco 7, Cal.
2207 1st Ave. S. . . . . Seattle 4, Wash.
1417 Pine St. . . . . St. Louis 3, Mo.
1529 S. Yorktown St. . . . . Tulsa, Okla.
524 N. Avalon Blvd. . . . . Wilmington, Cal.

71-1-1

BEHIND THE IRON CURTAIN

what goes on—beyond this barrier?

Not always what theory teaches us. More than modern instrumentation can tell us. Much, indeed, that only off-the-line inspection will reveal — too late, perhaps, for corrective action.

Yet here-and-now facts on the condition of internal boiler surfaces are always yours when APEXIOR NUMBER 1 guards tube and drum steel.

For APEXIOR permanently stabilizes metal beneath a surface which moisture cannot penetrate. Thus isolated from any environment with which it can react to its own detriment, APEXIORized steel loses none of the characteristics of new or newly cleaned metal — can be depended upon for changeless year-in, year-out service.

A further benefit is that APEXIOR's smooth surface attracts fewer and less tenacious deposits so that tubes and drums stay cleaner longer for uniform heat distribution, better circulation and constant high heat transfer efficiency.

These are some of the reasons why for 31 years APEXIOR has played so important a role in the power plants of American industry — why today engineers in ever-increasing numbers specify it for boilers of all pressures and ratings, operating under all conditions of feedwater control.

For a complete picture of what APEXIOR protective surfacing can mean to your boiler, write us for more facts about

DAMPNEY Maintenance for Metal

THE DAMPNEY COMPANY of AMERICA • Hyde Park, Boston 36, Mass.

Eidsness, who will become Philadelphia district engineer under jurisdiction of Infilco's New York office.

Roger M Kyes has joined staff of **General Motors Corp.** He will work on special assignments, reporting directly to C E Wilson, president.

C J Tagliabue Corp (N.J.) has announced opening of a new sales office at 150 Broadway, New York 7, N. Y. L M Hackenberg, Tagliabue's New York district sales manager, will supervise activities of the new sales office, which serves the greater metropolitan area. This company is a wholly owned subsidiary of Weston Electrical Instrument Corp, Newark, N. J.

W W McCamon has been named sales engineer for marine and stationary diesel engines of heavy machinery div, **Nordberg Mfg Co,** Milwaukee, Wis.

Dravo Corp has completed transfer of its city offices from Dravo Bldg at 300 Penn Ave, Pittsburgh, Pa. to the former Pitt Bank Bldg, Fifth and Liberty Ave, purchased by the corporation last year. The 12-story building has been renamed Dravo Bldg.

A new customer engineering service dept, under direction of Robert C Singleton, has been established by Nelson stud welding div of **Morton Gregory Corp** at its Lorain, Ohio headquarters.

U S Rubber Co has named Graybar Electric Co exclusive distributor for Uskon conductive rubber panels used in radiant heating of homes by electricity. Graybar Co, with offices in 103 cities, will handle distribution of the panels on a nationwide scale through electrical contractors. E I Funk, supply specialties sales manager for the Graybar organization, will supervise sales of the Uskon line.

George J Hepp has been appointed varnish sales manager of **Irvington Varnish and Insulator Co,** Irvington, N. J.

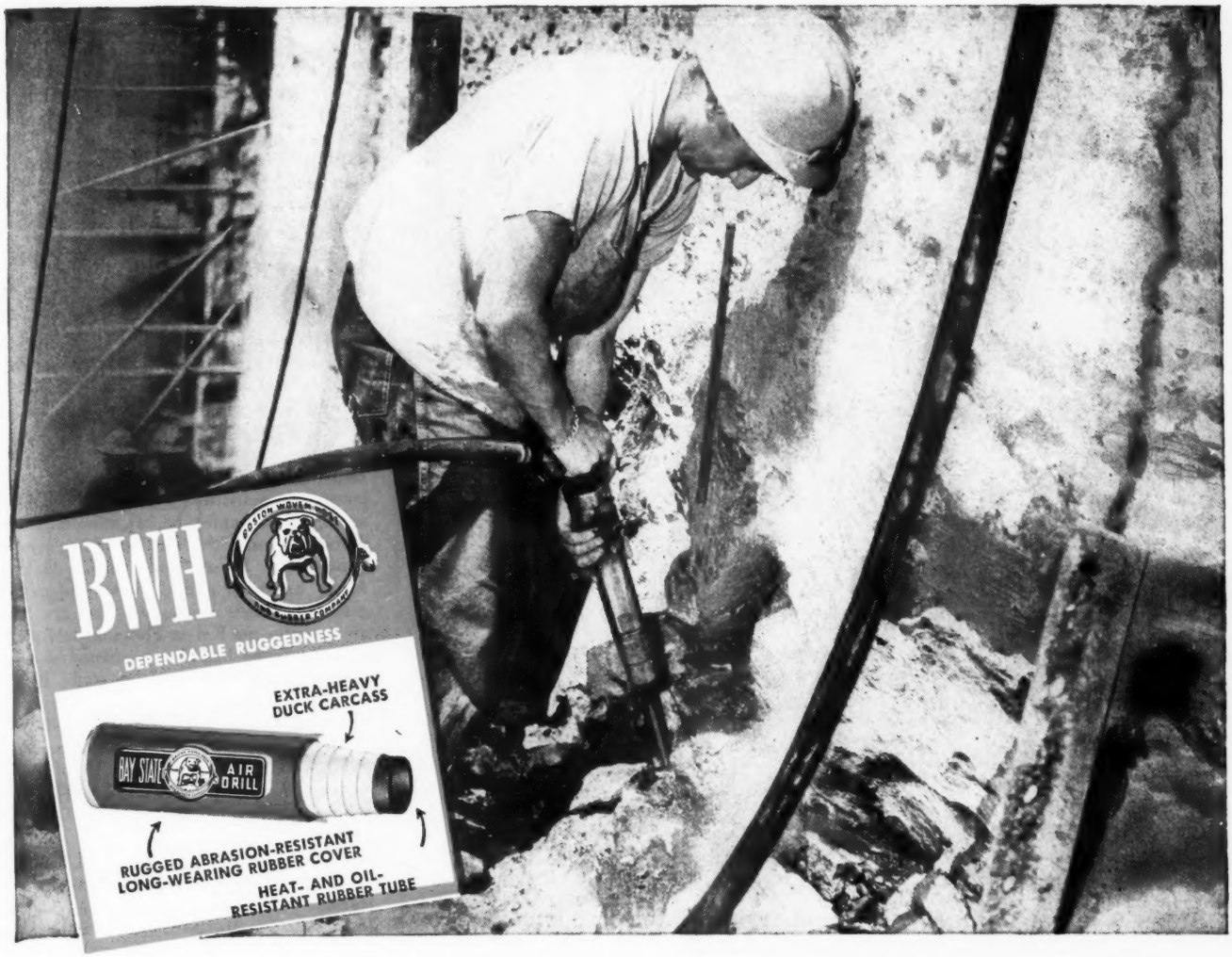
Liquid Conditioning Corp, Linden, N. J. announces appointment of T N Rimbach as district manager of territory comprising states of Mo. and Ark., eastern part of Kan. and southern part of Ill. His headquarters will be at 3903 Olive St, St. Louis 8, Mo.

John H Bartol has joined **W B Connor Engrg Corp,** 114 E 32nd St, New York 16, N. Y. as director of air recovery div.

Livingstone Engrg Co has moved to larger quarters in Worcester, Mass. Bradley C Higgins has been made assistant to president.

A W Nash Co, 5225 Wilshire Blvd, Los Angeles 36, Calif. has been appointed southern Calif. representative of **Ajax Flexible Coupling Co.**

Cutler-Hammer, Inc, has announced new and expanded quarters for Dallas district sales office and warehouse at 1331 Dragon St, Dallas 2, Texas. E K Anderson



ROUGH IDEA FOR A SMOOTH SURFACE

Another Top Performance by a BWH Product

When new concrete is applied to an old surface, tedious groundwork is involved. In this case, the mammoth face of a dam had to be roughed with compressed air into an irregular pattern that would hold the refacing material.

The air hose used on the job couldn't be any "sissy"! It had to take high pressures and high temperatures. It had to withstand oil, the crash of falling rocks, the shock of being yanked over jagged edges of broken concrete. After a careful survey, the contractor chose BWH Bay State Air Drill Hose for the job, and its outstanding performance more than justified his judgement.

Constructed with an extra-heavy rubber tube, this rugged hose has a carcass of multi-ply closely woven duck bonded with long-life friction. Tube and carcass are enclosed in a husky rubber cover that resists abrasion and weathering. This powerfully built hose performed perfectly, and helped the contractor finish the job economically, efficiently and right on schedule.

BWH Bay State Air Drill Hose is just one of the many famous rubber products made by BWH. Whatever industrial rubber goods you need, look to BWH products for dependable ruggedness and to BWH distributors for dependable service.

HAVE YOU A JOB WHERE STAMINA COUNTS?

Bring us your toughest problems — we're specialists in solving them. Consult your nearest BWH distributor, or write us direct.

Another Quality Product of

BOSTON WOVEN HOSE & RUBBER COMPANY

Distributors in All Principal Cities

PLANT: CAMBRIDGE, MASS., U. S. A. • P. O. BOX 1071, BOSTON 3, MASS.

"We installed a Henszey Feedwater Regulator in our Saratoga plant. It is a pleasure to mention that this has served us very satisfactorily. We have three boilers in our North Tonowanda plant for which we wish to consider the application of Henszey Boiler Feed Regulators."

VanRaalte Co., Inc.

The
HENSZEY
Boiler Feed
REGULATOR

The complimentary comments of this leading eastern textile manufacturer concerning the Henszey Boiler Feed Regulator concurs with the opinions often expressed by other aggressive manufacturers.

The Henszey Boiler Feed Regulator works on the metallic expansion principle — no small tubes to spring leaks — nothing to rust — nothing to get out of order. When the boiler needs water, the Henszey Regulator automatically springs into action — delivers just the right amount of water to bring the level back where it belongs. Provides positive boiler water level control continuously and accurately under all load conditions.

HENSZEY CO., Dept. D10, WATERTOWN, WIS.

The Henszey Boiler Feed Regulator is a simple, compact unit — installs right in the line — no additional supports are necessary. Made for pressures up to 600 lbs. and in sizes up to 4 inches.

HENSZEY

BOILER FEED REGULATORS

Continuous Blowdown • Distillation Systems • Heat Exchangers
Feed Water Meters • Flow Indicators • Proportioning Valves
also MILK EVAPORATORS and PRE-HEATERS

is Dallas district manager. Cutler-Hammer has acquired the business of West Electric Products Co, 1795 Pasadena Ave, Los Angeles, Calif. W G Tapping, Cutler-Hammer district sales manager, will be in charge of the new plant. Sale of the firm's products in Los Angeles area will continue to be handled by the company's sales office at 1331 Santa Fe Ave, Los Angeles 21, Calif.

Economy Pumps, Inc, Hamilton, Ohio, has named R G Dinham Co, Wesley Temple Bldg, as distributor.

William Brunkala has been added to **Stearns Magnetic** technical staff at Milwaukee and will serve as an assistant to Harold W Buus, physicist and research engineer in charge of the Stearns laboratory.

Henry J Kaiser announces that because of increased activities of several **Kaiser**-managed companies, he has appointed A B Ordway to executive staff handling over-all policies of Kaiser industries. Jack L Ashby has been named vice-president and general manager of iron and steel div. This div operates the Kaiser Fontana steel plant. C Bruce Wood has been promoted to assist Ordway on Kaiser executive staff. Robert Walker has been promoted to controller, with headquarters in the head office in Oakland. A P Heiner has been made assistant to vice-president in charge of public relations for the company. His offices will continue to be in Kaiser Bldg in Oakland.

Bailey Meter Co has named G L Harman Jr manager of Milwaukee branch office. Harman replaces R V Knapp, who resigned. In Milwaukee, Harman will be assisted by J L Andrews, mechanical engineer, and L C Smith, service engineer.

Fred S Bacon Jr has been appointed assistant general sales manager of **Rockbestos Products Corp.** He will assist H O Anderson, vice-president in charge of sales. In his new post, Bacon will have immediate responsibility for general sales, advertising and sales promotion.

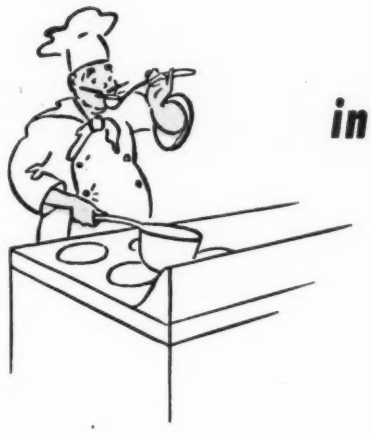
U. S. Radiator Corp announces that Howard B Steggall, vice-president in charge of company's Pacific steel boiler div, has been elected a director of the corporation, replacing Carroll M Baumgardner on the board. Baumgardner resigned as director and executive vice-president.

V St. C Monteith has been appointed manager of plant engineering dept, **Dayton Rubber Co,** Dayton, Ohio. He succeeds L B Gordon, whose death occurred in April of this year.

De Laval Steam Turbine Co has named J A Greenland as district manager of De Laval Seattle office.

National Supply Co, Pittsburgh 19, Pa. has elected Arthur W McKinney, vice-president and general manager, to newly created position of executive vice-president of the company. Robert W Eiler, secretary and general attorney of National Supply, has been made a director. He replaces Charles R Barton, retired, on board of di-

SPECIALISTS GET BETTER RESULTS



in cooking...

Aloyco Gate Valve No. 111. This leader of corrosion-resistant valves has double-disc, ball-and-socket type wedges, which are free to rotate and are non-fouling in any position, providing positive closure at all times.

...and in VALVE MANUFACTURE

High grade restaurants have a tendency to specialize in certain dishes, for which they become famous. This same trend toward specialization has proved its effectiveness in the manufacture of quality valves.

We specialize in one product exclusively—valves for service in corrosive-fluid pipe lines. Concentration in this one field has developed a valuable technological background in this organization that we are glad to place at the service of any manufacturer who has problems relating to valves that must have high corrosion-resistant qualities.

We offer our customers the benefit of long experience in the chemistry of corrosion and contamination, the metallurgy of corrosion-resistant alloys and the designing and manufacturing experience that assures best results in the production of valves that are metallurgically and mechanically correct. Let us discuss your requirements with you.

ALOYCO

STAINLESS STEEL VALVES AND FITTINGS

GATE, GLOBE, Y, CHECK, TANK, SAMPLING AND V-PORT VALVES
SCREWED AND FLANGED FITTINGS

ALLOY STEEL PRODUCTS COMPANY, INC.

1403 WEST ELIZABETH AVE. • LINDEN, N. J.

RECOMMENDATIONS ON MAGNETIC SEPARATORS for taking Tramp Iron out of Coal

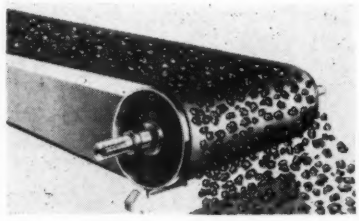
THERE is a Dings Magnetic Separator for every power plant or boiler room requirement . . . from the big 48" x 48" electromagnetic pulleys used by modern central stations to the little Alnico Perma-Plate magnets for plants using small stoker-fired heating boilers. Detailed descriptive literature and recommendations from Dings engineers are available on request to help you select the separator best suited to your needs.

MAGNETIC PULLEYS

Magnetic Pulleys are recommended on the majority of belt conveyor installations because they *automatically* remove and discharge the tramp iron.

NEW! THE ALNICO PERMA-PULLEY—magnetic permanence *guaranteed* for the life of the installation . . . powerful, trouble-free. Suitable for most pulley requirements. Ask for Catalog C-1007A.

AIR-COOLED ELECTROMAGNETIC PULLEY—recommended for very heavy burdens because of great depth of magnetic flux penetration. Catalog C-1001A.

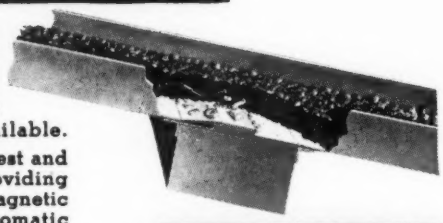


RECTANGULAR ELECTROMAGNETS

Uniform magnetic flux pattern across entire face of magnet, plus great depth of magnetic penetration and high surface strength, make Dings triple pole rectangular magnets the most powerful tramp iron magnets available.

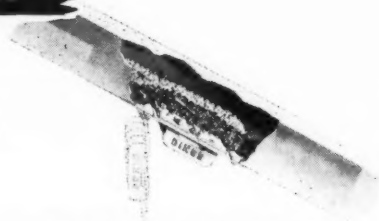
CHUTE TYPE—stepped face helps arrest and hold iron mechanically as well as providing extra magnetic edges for intense magnetic concentration. Available with automatic safety gate to stop flow if current is interrupted; gate also used to remove accumulated iron. Catalog 301-A.

SUSPENDED TYPE—recommended for use above belt where pulley is not applicable due to excessive speed, burden depth or other reasons. Also used above chutes. Available in AUTOMATIC SELF-CLEANING TYPE with cross belt which discharges iron to the side. Ask for Catalog 301-A.



NEW! PERMA-PLATE MAGNETS

Here's low cost, powerful, permanent magnetic protection. For installation above or in chutes and above belts. Ideal for stoker protection. Non-electric; magnetic permanence *guaranteed* for life of installation. Send for Bulletin B-1205A.



Dings MAGNETIC SEPARATION HIGH INTENSITY

DINGS MAGNETIC SEPARATOR CO.
4765 W. McGeogh Avenue
Milwaukee 14, Wis.

Separation Headquarters Since 1899

rectors. Superior engine div has appointed J G Wilson regional manager at Fort Worth, Texas. Wilson succeeds A B Reese Jr, who has been made chief oil field engineer for Superior engine div. This div has named Wren Malone manager of Springfield region, with headquarters at Springfield, Ohio. He succeeds E D Cahill, who has been assigned other duties in Springfield sales dept. In addition to handling sales of Superior marine and stationary engines in Springfield region, Malone will have charge of inland waterway sales on Ohio River and its tributaries between Pittsburgh and Cairo, and on the Mississippi and its tributaries as far south as and including Memphis, Tenn.

Whitley B Moore has been elected vice-president in charge of sales of **Timken Roller Bearing Co,** Canton 6, Ohio, succeeding L M Klinedinst, who has retired after 43 years of service. However, Klinedinst will remain a director of the company and serve further as sales consultant.

A Kolstad, of Kolstad Engrg and Sales Co, 38 Giralda Walk, Long Beach 3, Calif. has been appointed sales representative for **Thomas C Wilson, Inc.**

T J Hodan has been named manager of **Allis-Chalmers** water-conditioning dept. Hodan succeeds W L Manly, who has been appointed manager of Allis-Chalmers dealer sales. Manly succeeds W A Meyer, who has been named assistant manager of Texrope drive dept. R E Yates, Gorman E Hunt Jr and Joseph Conrad have been named to handle all general machinery div dealer accounts in Portland, Ore., Kansas City, Mo., and Pittsburgh, Pa., district office areas, respectively.

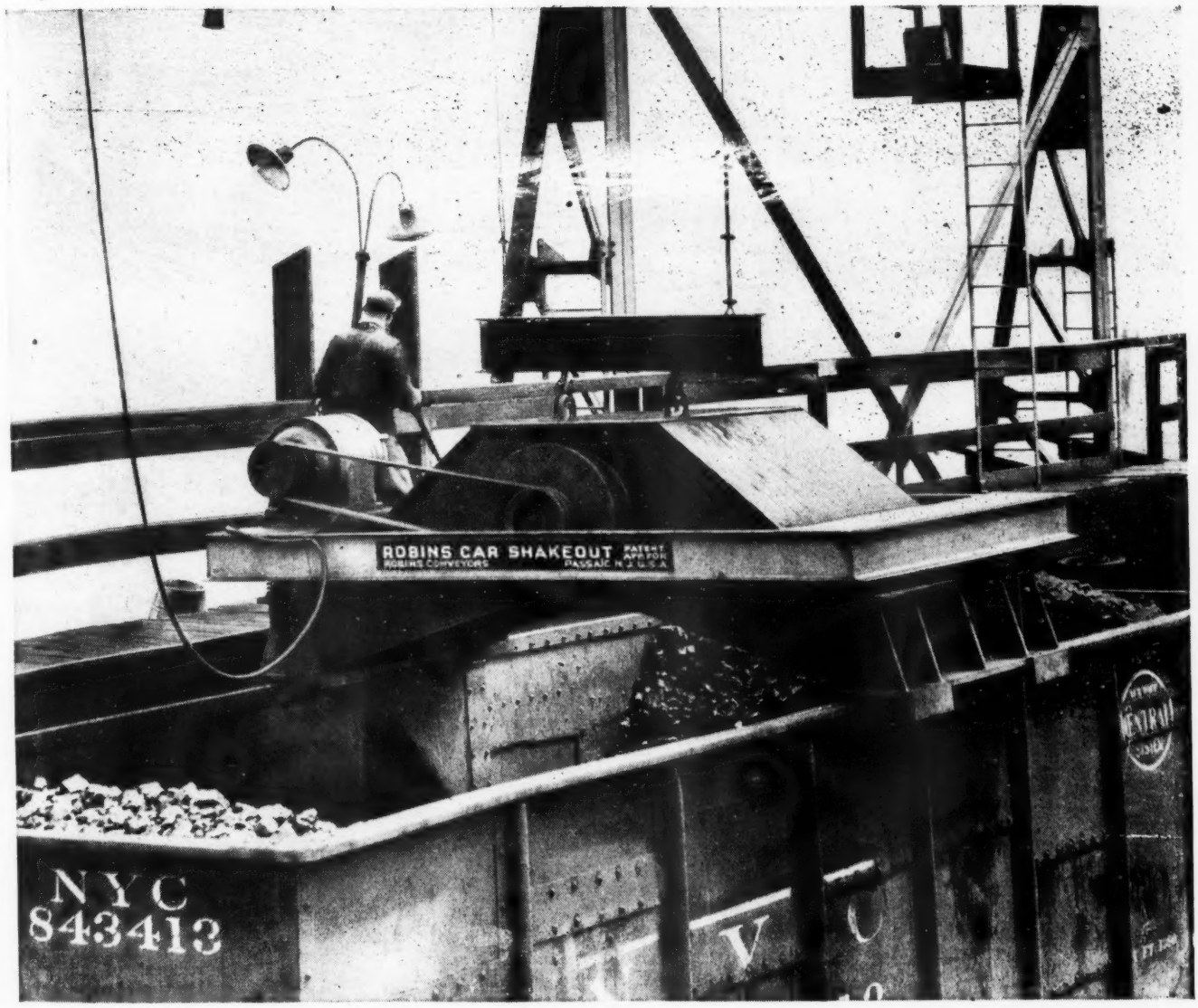
Wheelco Instruments Co has opened a new office at 138 E Becher St, Milwaukee 7, Wis. M A Embertson is in charge of the new Wis. office.

Ray R West has become manager of sales of **Minneapolis-Honeywell Regulator Co** products for industrial applications. West will make his headquarters at the Brown plant in Philadelphia. Lloyd E Slater has been appointed industry engineer in charge of food-industry applications for measuring and controlling devices, made by Brown Instrument Co and Minneapolis-Honeywell Regulator Co.

Worthington Pump and Machinery Corp announces appointment of Frederick J. Ellis as assistant merchandising manager, pumps and compressor sales.

James Boyd has been made general sales manager of Hamilton div of **Lima-Hamilton Corp.** This div manufactures diesel and steam engines, machine tools, presses for automotive industry, can-making and special machinery, and other industrial equipment.

Eutectic Welding Alloys Corp has named L D Richardson to board of regional sales supervisors. He will operate in south central area of the U. S., responsible for that portion of the 160 Eutectic field engineers



Are you paying too much to unload cars?

You are if you use manual methods.

In the first place, you need two to six men—or more. Chances are it takes them up to an hour to empty one car . . . much longer at times. And you pay heavy demurrage while cars wait on your siding to be unloaded.

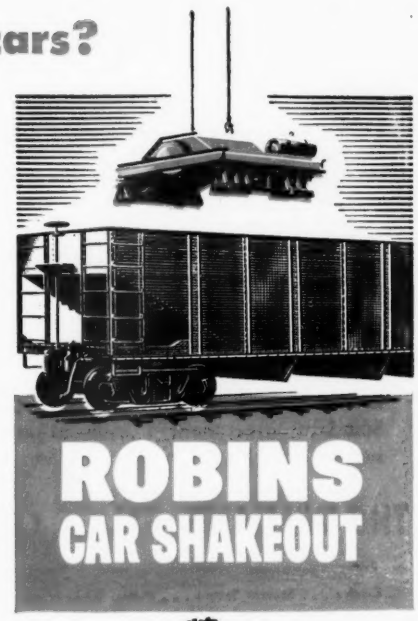
All that is unnecessary today . . . when you use the Robins Car Shakeout! It *shakes out* the coal or other bulk material. And it *shakes* down your unloading costs . . . practically wipes out demurrage.

With a Robins Car Shakeout, you can unload a 70-ton car "broom clean" in a matter of minutes. At most, you need only two men . . . one to open the hopper doors, one to operate the Shakeout. Many times, one man can do both jobs.

All your operator does is place the portable Shakeout on the car and push a button. Then your Shakeout takes over. It shakes stubborn material loose . . . cascades it freely through the hopper doors.

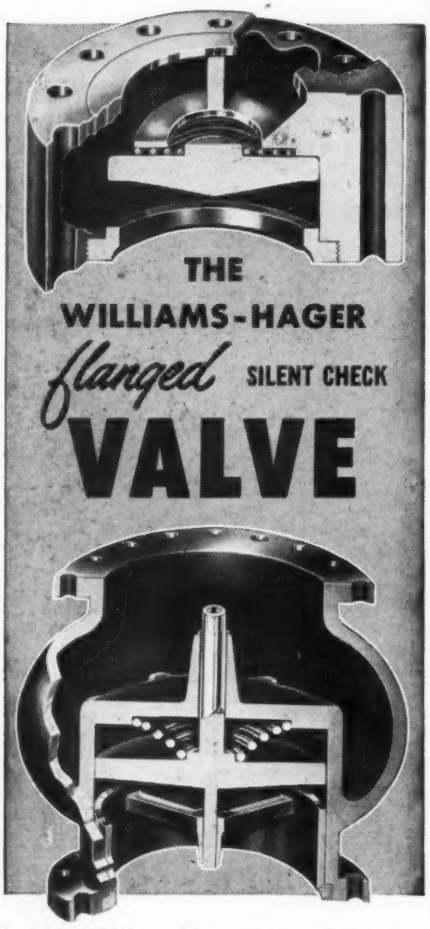
Hundreds of users are proving every day that this method of unloading hopper cars is as much as *twelve times faster* than manual methods. Why not find out today how the Robins Car Shakeout can save time, manpower and money for you?

A note on your company letterhead to Dept. P-10, Robins Conveyors Division, Passaic, N. J., will bring you this new booklet about the Robins Car Shakeout. Or ask for a Robins engineer to tell you the complete story in person. No obligation!



Robins Conveyors Division • **HEWITT-ROBINS INCORPORATED**

STOP WATER HAMMER



The Williams-Hager Flanged Silent Check Valve is available for every service . . . bodies of Iron, Semi-Steel, Cast Steel, Government Bronze, Stainless Steel or Monel Metal . . . fitted with seats and discs of either Government Bronze, Stainless Steel or Monel. Standard sizes from 1 inch to 20 inches. *Write for new technical bulletin.*

THE WILLIAMS GAUGE CO.

Pump Valves . . . Water Gauges . . . Gauge Cocks . . . Steam Traps . . . Pump Governors . . . Feed Water Regulators . . . Water Columns

2055 PENNSYLVANIA AVE. · PITTSBURGH (12), PA.

active in that region. Robert H Groman has been appointed to board of regional sales supervisors, with responsibility for west central area of the U. S., which has 160 Eutectic field engineers active in that region. William R Bajari is Eutectic regional sales supervisor in western region of the U. S., responsible for 160 Eutectic field engineers active in that area.

Elliott Co has appointed C F McGinnis assistant sales manager of Ridgway div.

Carl G Rising has been named plant engineer of **S E and M Vernon Co,** Elizabeth, N. J.

Allen-Bradley Co announces removal of its northern Ohio district office to 4312 Carnegie Ave, Cleveland 3, Ohio. R J Roy continues as district manager.

Robert M Vilsack has joined sales dept of **Taylor Forge & Pipe Works,** reporting to main plant at Chicago, Ill.

James B Irwin Jr has been appointed assistant to president of **Monsanto Chemical Co.** He succeeds R U Haslanger, who has been named assistant to general manager of western div, at Seattle, Wash. Donald B McCammond has been made assistant to director of industrial and public relations. In his new assignment, McCammond will supervise eastern operations of the dept. He will have direct charge of activities of the company's public relations offices in Boston and Springfield, Mass., and in N. Y. Also, McCammond will continue to serve as divisional director of public relations for Merrimac div with headquarters at Everett, Mass. James G Zack, divisional director of public relations for Monsanto's plastics div at Springfield, Mass., has been transferred to St. Louis headquarters. Zack will supervise industrial relations publications for the dept. Jonathan H Sprague Jr has been made a technical representative of Monsanto in Washington, D. C. Sprague joins staff of Philip Singleton, assistant to president, in charge of company's Washington bureau.

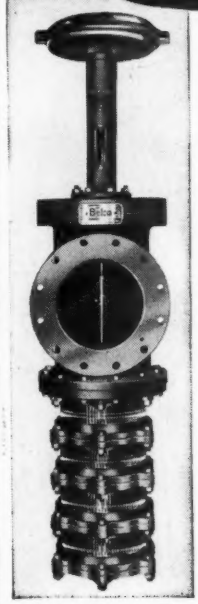
Air Reduction Sales Co has appointed Adelson-Wirts, Inc an authorized dealer in Airco products. The new firm is at 1800 Park St, Hartford, Conn.

Board of directors of **Mathieson Chemical Corp** has elected Thomas S Nichols, president and chief executive officer, to additional post of chairman of board to succeed the late George W Dolan. J C Leppart has been elected a member of board to fill vacancy caused by Dolan's death and has been appointed executive vice-president.

Central Electric and Gas Co announces retirement of C C Hellmers as district manager of Lincoln, Neb. Hal A Thorson will succeed Hellmers.

E C Rees, Waycross div manager of **Georgia Power & Light Co,** has been elected a vice-president.

Charles A Clancy, assistant general superintendent of Niagara Falls Power Co, has become general manager of that company's



Illustrated is the Belco Deaerating Heater Steam Dome and pressure compensating spray valve.

BELCO DEAERATING HEATER

This new Belco Deaerating Heater accomplishes both heating and complete deaerating in a few seconds time. The spray valve fills the stainless steel dome with a cloud of droplets which are contact heated and degasified by the inrushing steam. Intermingling of steam and water also drives out a portion of the CO_2 held in the bicarbonates.

Contact with heated baffle plates and impingment of counterflow steam insures complete removal of all gases. Degasified water is ejected into the deaerated storage compartment by the incoming steam—triple assurance that all traces of gas are removed before the water leaves the heater.

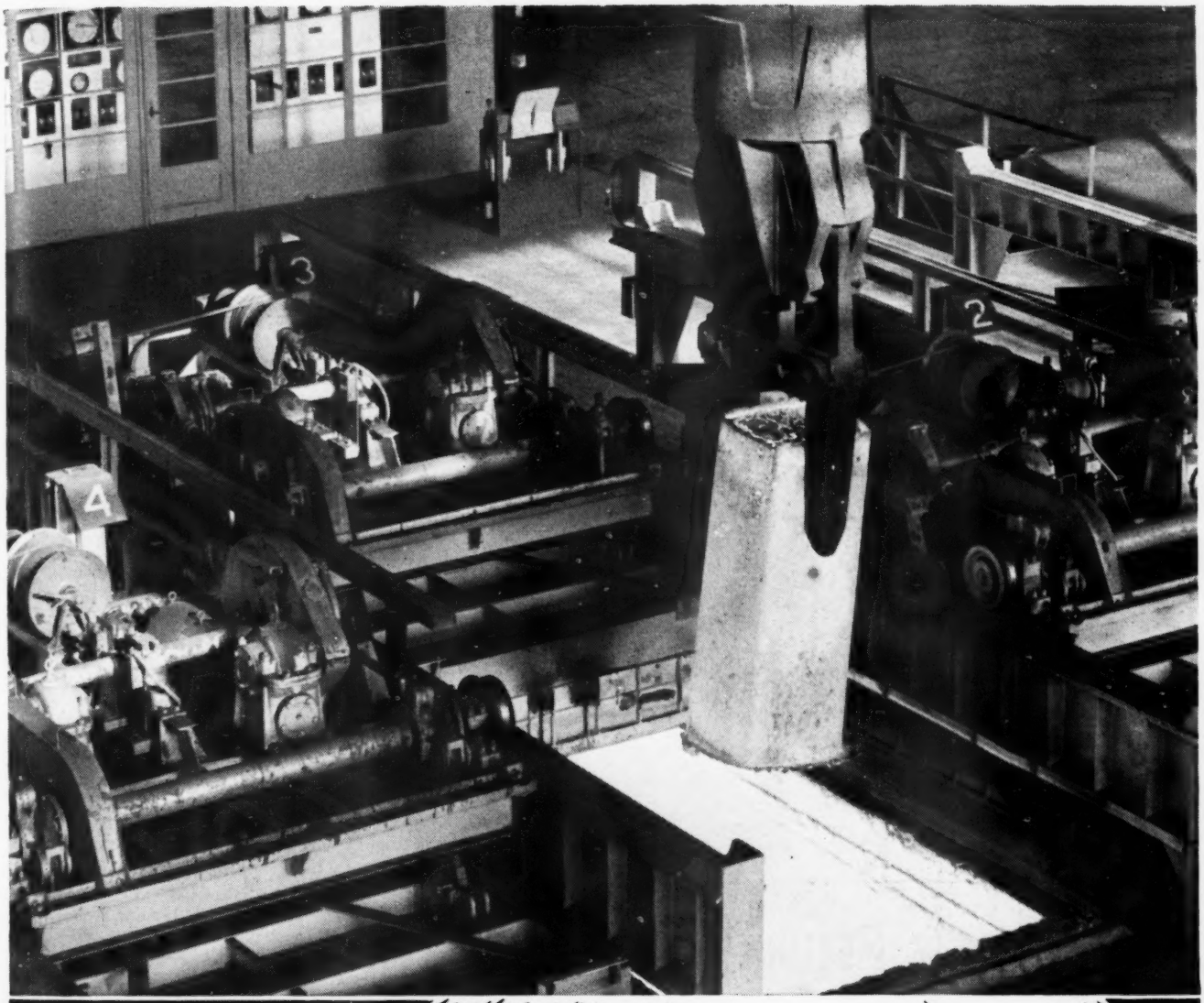
MODERNIZATION RESULTS IN LARGE OPERATING SAVINGS

Belco engineers are specialists in conversion and modernization of existing plants. The knowledge gained in designing the world's largest automatic demineralization and silica removal plant can be used to reduce your operating costs.

BELCO INDUSTRIAL EQUIPMENT DIVISION, INC.
50 Iowa Avenue Paterson 3, N. J.
In midwest: Deady Chemical Co., Kansas City, Mo.
In southwest: Watermasters, Inc , Houston, Tex.
In Pacific: Deady Chemical Co., Los Angeles, Cal.

Belco

PROCESSES FOR REMOVAL OF WATER IMPURITIES



BE SURE OF YOUR CIRCUITS UNDER TOUGHEST CONDITIONS

—FOR INSTANCE, UNDER BAKING HEAT

This open steel mill soaking pit presents just about the best example of the worst conditions wire and cable have to work under. Power and control circuits are exposed to the blasts of white-hot heat from the pits and suspended billets—that's why they are wired with *permanently insulated* Rockbestos A.V.C.

Your maintenance-boosting circuits may not have to take such severe conditions, but you'll protect operations and save worry and work when you wire the hot spots with Rockbestos A.V.C. wires, cables and cords. Impregnated asbestos braid and felted asbestos insulation are the answer to wiring problems. Their inherent heat and flame resistance makes Rockbestos A.V.C. wires and cables *permanently dependable.*

Wherever heat and moisture, grease, oil or corrosive fumes may cause wire-failure—wire with Rockbestos A.V.C. and *insure* service.

WRITE TODAY—for your copy of the new No. 10-F Catalog, sectioned for easy reference to permanently insulated Lighting Wires, Power & Control Cables; Apparatus Wires & Cables; Switchboard, Fixture, Electronic and Magnet Wires.

ROCKBESTOS PRODUCTS CORP.
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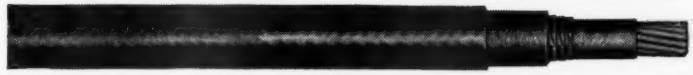
NEW YORK CLEVELAND DETROIT CHICAGO
PITTSBURGH ST. LOUIS LOS ANGELES OAKLAND, CALIF.

ROCKBESTOS



THE WIRE WITH PERMANENT INSULATION

"GUNITE" Concrete

(since 1915)

Linings for

STEEL BUNKERS •
DUCTS, HOPPERS •
STACKS •
UPTAKES •
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STEEL & PIPE •
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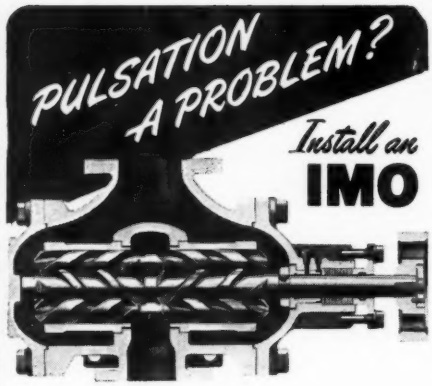


With an IMO Pump delivery is not interrupted by the periodic strokes of a piston or the opening and closing of valves and ports. The turning of the rotors in an IMO forces the fluid from suction to discharge in a continuous, uniform flow.

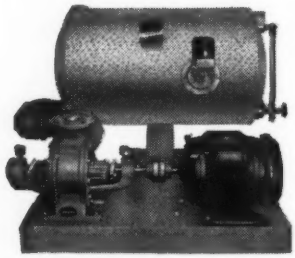
IMO pumps can be furnished for practically any capacity and pressure required for oil, hydraulic-control fluids, other liquids.

Send for Bulletin 1-145P.

IMO PUMP DIVISION of the
DE LAVAL STEAM TURBINE CO.
TRENTON 2, NEW JERSEY

CONDENSATE RETURN *at its* BEST

Capacities to 150 G. P. M.
(Both Horizontal and Vertical)



APCO Horizontal Simplex Condensation Return Unit

These units are available in simplex and duplex types —designed for the automatic return to high and low pressure boilers of the hot water condensation from radiators, coils, etc. Catalogued in sizes ranging from 2,000 to 100,000 sq. ft. equiv. radiation. Larger sizes available.

APCO TURBINE-TYPE PUMPS

Apcos are ideal for the above service or any small capacity, high head duty. The one moving part, the impeller, is free running without metal-to-metal contact. Designed for high temperature water and liquids. Capacity remains practically constant against drastic head pressure variations.

AURORA CENTRIFUGALS
for Every Pumping Job
HORIZONTAL SPLIT CASE
Single & Two Stage
SIDE SUCTION
VERTICAL
NON CLOG
SUMP
MIXED FLOW
DEEP WELL TURBINES
SPECIAL DESIGN

Write for CONDENSED CATALOG "M" or

SEE OUR CATALOG IN SWEET'S

DISTRIBUTORS IN PRINCIPAL CITIES

AURORA Always PUMPS

AURORA PUMP COMPANY

50 Loucks Street, AURORA, ILLINOIS

Canadian subsidiary, **Canadian Niagara Power Co, Ltd.** W Donald Bracken continues as vice-president and general superintendent of the Canadian company's Niagara Falls district.

B F Hampshire has been appointed general manager of **Montaup Electric Co,** Somerset, Mass., succeeding George U Parks. Parks has joined the Boston Edison Co.

Samuel E Cooper has been named first vice-president of **Omaha public power district** and Fay E Smith has been promoted to executive manager. They were named after power district board of directors received resignations of Charles D Saunders as vice-president and director, and Roy Page as executive manager.

Detroit Edison Co announces that Harry G Hall, superintendent of underground lines, has retired. Lemore W Clark has been appointed superintendent to succeed him and Frank C Marschner has been made assistant superintendent.

Dr Frank Dana Carvin has been named head of dept of mechanical engineering at **Illinois Institute of Technology.** James C Peebles, dean of engineering, has retired. Dr John T Rettaliata has become dean.

New York University College of Engineering has announced that Dr Glen N Cox has accepted post of professor of hydraulics and mechanics.

Edward D Emerson has been made assistant professor of mechanical engineering at **University of Massachusetts,** Amherst.

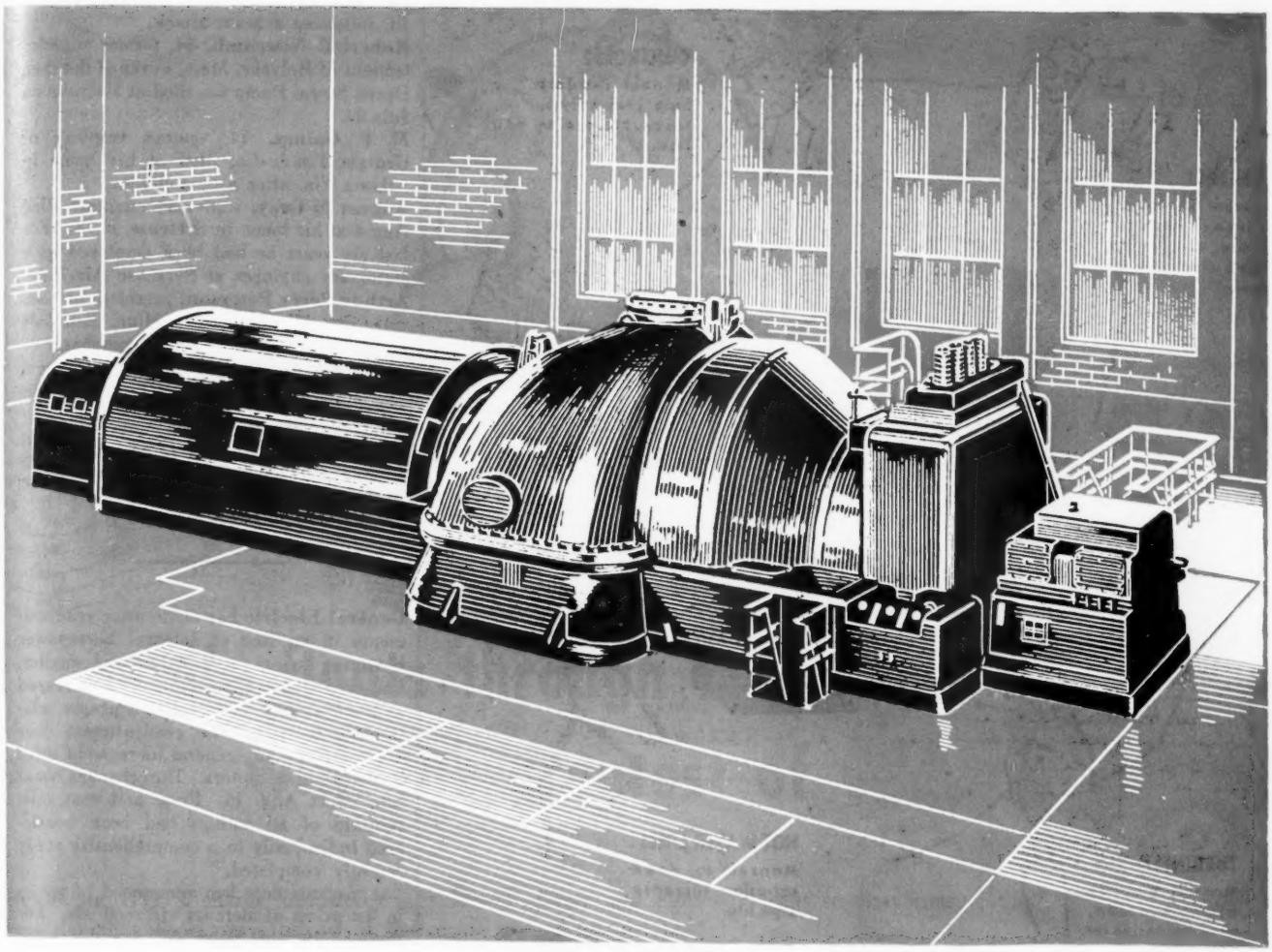
Bureau of Mines has named William J Fene as assistant chief of health and safety div and Marling J Ankeny as chief of coal-mine inspection branch.

Appointments of members of various standing committees of **Stoker Manufacturers Assn** for ensuing year were announced recently: (1) Joseph G Beard, Chicago, assistant manager, stoker div of Illinois Iron and Bolt Co, has been named chairman of the association's engineering and research committee. (2) E W Oeffinger, New Albany, Ind., chief engineer, Anchor div, Stratton & Terstegge Co, has been made vice-chairman. (3) Walter Sormane, Mendota, Ill., sales manager, Conco Engrg Works, has been made chairman of trade relations committee, which has duty and responsibility of conferring with representatives of allied and other industries on subjects and problems of mutual interest. (4) Frank Hoke, Indianapolis, Ind. has been named chairman of a special 3-man steering committee on membership affairs.

Stone & Webster Engrg Corp has elected E H Krieg consulting engineer in Boston office.

Sam Tour & Co, engineers, metallurgists, consultants, announces appointment of Howard Kapner to be in charge of the new glass section. Kapner will be at 44 Trinity Pl, New York, N. Y.

YES! Tycol Aturbrio Turbine Oils perform better . . . BETTER . . . BETTER



Tycol Aturbrio Turbine Oils perform better because:

. . . *Tycol Aturbrio Oils* are "double inhibited" to resist oxidation and prevent rust.

. . . *Tycol Aturbrio Oils* provide maximum resistance to emulsification . . . permit continuous operation without sludge formation.

. . . *Tycol Aturbrio Oils* have shrunk lubrication costs in hundreds of plants . . . performing superbly for years without a change.

Complete and detailed information on Tycol Aturbrio Turbine Oils is available from your nearest Tide Water Associated Office. Call or write today.

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INDUSTRIAL LUBRICANTS

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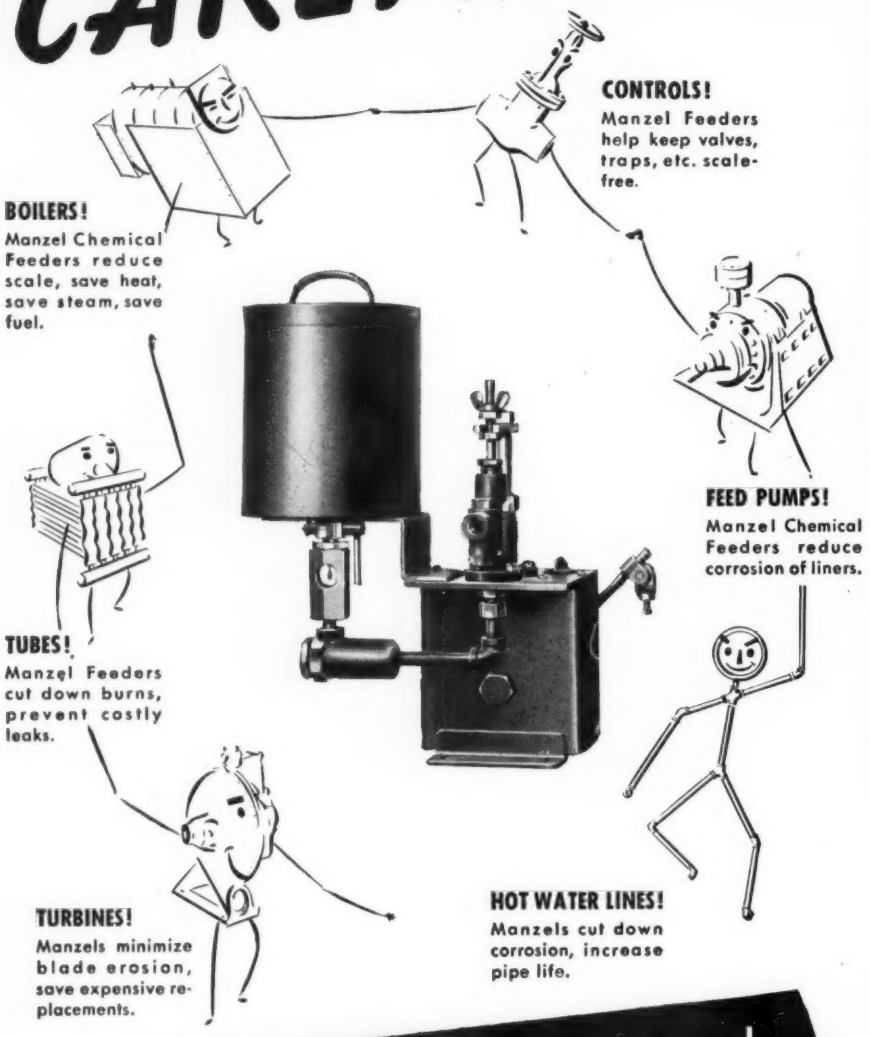
LUBRICATION — "ENGINEERED TO FIT THE JOB"

CAREFREE!


CONTROLS!
Manzel Feeders help keep valves, traps, etc. scale-free.
BOILERS!
Manzel Chemical Feeders reduce scale, save heat, save steam, save fuel.
FEED PUMPS!
Manzel Chemical Feeders reduce corrosion of liners.
TUBES!
Manzel Feeders cut down burns, prevent costly leaks.
TURBINES!
Manzels minimize blade erosion, save expensive replacements.
HOT WATER LINES!
Manzels cut down corrosion, increase pipe life.

Smart Power Engineers Use Manzel Chemical Feeders to Keep Water Correctly Treated... Automatically

● Whatever chemicals are recommended by corrosion experts, there is a Manzel Feeder to inject them automatically into your water lines in the exact proportion needed.

Manzel Chemical Feeders are available for operation from reciprocating drive, from rotary drive, from electric motor drive, and from gas or air pressure. They have been famous for many years for dependability, accuracy and economy. You, too, can reduce replacement and fuel costs, prevent breakdowns, insure profitable operation. Call your nearest Manzel representative or write...

Manzel Inc. now supplies repair parts for all models of Bowser and Torrington Lubricators.

Builders of HIGH PRESSURE METERING PUMPS Since 1898

Manzel INC.

326 Babcock St.
Buffalo 10, N. Y.

OBITUARIES

D C Canning, 50, engineer of Canadian General Electric Co, died suddenly in Aug 17 in Peterboro, Ont. after a short illness.

Neil C Hurley, 78, chairman of board of Independent Pneumatic Tool Co, Aurora, Ill. died Aug 2 at his home in River Forest, Ill. following a heart attack.

Robert E Newcomb, 64, former superintendent of Holyoke, Mass, works of the then Deane Steam Pump Co, died at Holyoke on July 24.

M P Gaines, 74, veteran employe of Georgia Power Co, died at his home in Atlanta, Ga. after a long illness.

August M Gray, stationary engineer, died Aug 4 at his home in Syracuse, N. Y. For last six years he had been employed as a stationary engineer at Syracuse Air Base.

Arthur Perry Peterson, president of Control Corp, Minneapolis 14, Minn. died July 16 as a result of a cerebral hemorrhage.

Samuel Hill Gilson, stationary engineer in Toronto, Ont. for 40 years, died at his home on July 23.

Oakley Baskin, 66, retired superintendent of power dept of International Railway Co, Buffalo, died Aug 11 at his home after a heart attack.

General Electric has made price readjustments in its line of integral horsepower induction motors rated 200 hp and smaller. List prices have been reduced or increased as much as 20% to establish a proper relationship to costs. This readjustment does not constitute any general increase in price level of these motors. The changes went into effect Aug. 16. Price and cost relationship of all ratings had been considered individually in a comprehensive study recently completed.

Apparatus dept has announced increases in list prices of mercury arc rectifiers. For these equipments rated 500 kw and smaller, prices are increased to the level in effect before April 19, 1948, when a 5% decrease was made in price of switchgear and transformer components of the rectifiers. Price of tank-type rectifiers, generally rated over 500 kw, is increased by withdrawing a 5% reduction in price of the switchgear component made April 19, 1948. In addition, prices of the transformer and electronic components of this equipment are increased to 50 instead of 45% over 1941 levels.

Steel and tube div of Timken Roller Bearing Co has announced further adjustments in prices of certain products. These price adjustments went into effect July 28. Earlier, Timken had announced a 5% increase in prices of all alloy-steel products pending a study of changes in its manufacturing costs. The company has raised prices of its alloy-steel bars, blooms, billets and seamless tubing and made certain changes in its published extra lists of alloy steels. Increases in prices of bars, blooms and billets represent a 3 to 4% increase. Prices of seamless tubing are 4 to 10% higher. A 5% increase in price of Timken tapered roller bearings went into effect Aug 1. A similar increase was placed in effect Jan. 1.

He floats through the air with the greatest of fees

High-flying BTU's charge industry costly fees every day they float away instead of delivering heat energy where it counts. And they do that wherever inadequate insulation — or no insulation — gives 'em an opportunity to escape. The waste in heat energy . . . the waste in production . . . the waste in dollars . . . is enormous.

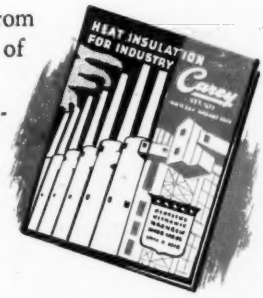
CAREY ADDS A NEW NOTE! Proper utilization of heat energy throughout a plant is provided by **CAREY'S** *Complete Industrial Insulation Service.* Developed by over 60 years of helping industry *locate and eliminate* leaks in heat energy, this service includes:

Practical engineering experience gained from development of industrial insulation jobs of all kinds and sizes.

A complete line of industrial insulation materials, including—

85% MAGNESIA, ASBESTOS, INDUSTRIAL ROCK WOOL

Materials strategically warehoused from coast to coast.



AVAILABLE TO HELP YOU! Carey's Complete Insulation Service is set up to give you everything from an insulation survey to a complete installation...to keep BTU's on the job. Make full use of it at any time! Meanwhile you'll want to...

Write for your free copy of "Heat Insulation For Industry." This helpful booklet is an excellent guide to selection of industrial insulation—contains specifications and tables you'll want to keep handy. For your *free* copy address your request to Dept. PO-10.

Carey 75 *years serving home and industry*

THE PHILIP CAREY MANUFACTURING CO., CINCINNATI 15, OHIO

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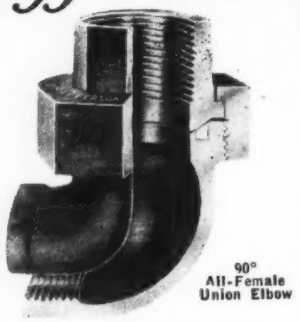
85% MAGNESIA
INDUSTRIAL ROCK WOOL
ASBESTOS

Pipe Coverings • Sheets • Blocks
Batts • Papers • Air-Cell

Jefferson



90° All-Female Union Elbow

. . . the UNIONS with the RECESSED BRASS SEAT . . .

simplify installation of Leakproof Piping Jobs

The All-Female Jefferson Union Elbow shown here (made also in Male-Female type) takes the place of a straight union, nipple and elbow, thereby saving two pipe joints, labor and maintenance.

The exclusive Jefferson Recessed Brass Seat is standard construction and provides the means of making tight joints with minimum wrench pressure, and without restricting flow through the fitting.

Get full details of the complete Jefferson line . . . from your nearest distributor, or from us direct.

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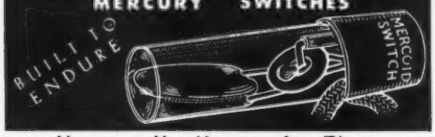
MERCOID

MERCURY SWITCHES



Universally Known for Their Superior Quality and Workmanship

They are not affected by dust, dirt or corrosion and have many definite applications where open contacts are not suitable. Various types available. MERCOID is your guarantee of the best in mercury switches. Further information sent upon request.

LET MERCOID SOLVE YOUR CONTROL PROBLEMS

MERCOID CONTROLS WITH MERCURY CONTACT SWITCH rank first for convenience of adjustment—dependable service and long life.

They are designed for various applications requiring the control of pressure, temperature, liquid level and mechanical operation.

AVAILABLE IN EXPLOSION-PROOF CASE FOR HAZARDOUS LOCATIONS

Complete Mercoid Catalog sent upon request.

THE MERCOID CORPORATION, 4201 BELMONT AVE., CHICAGO 41, ILL.

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NATIONAL EXPOSITION OF POWER & MECHANICAL ENGINEERING

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NOV. 29 to DEC. 4

Latest cost-saving equipment, materials and practices for producing and using steam, electric and mechanical power await you here. Also many new ideas for materials handling—for power expansion and modernizing, for plant services. New ideas on design, installation, operation and maintenance you can profitably use today and tomorrow. Don't miss this! Come—see first hand demonstrations—learn how you can cut power costs.

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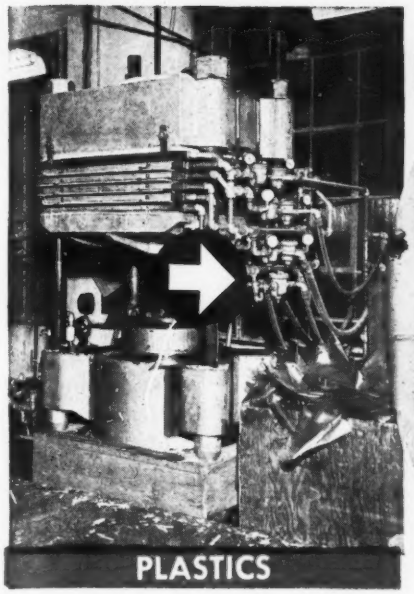
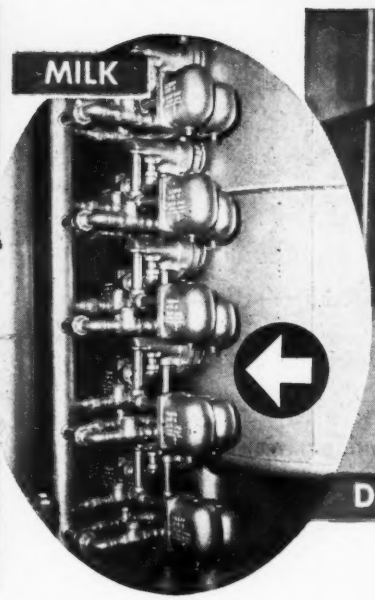
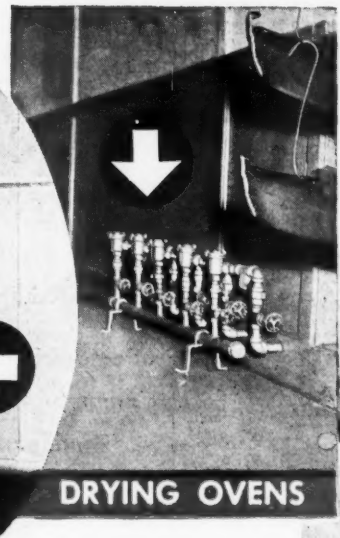






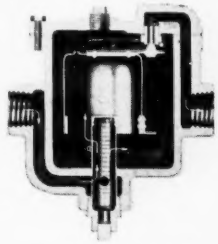
ALL-OUT HEAT USERS -*All Sarco*

When you buy steam traps, it pays to use just as many as necessary to assure efficient drainage and venting of every individual unit.

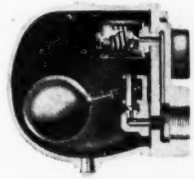
That's why you see so many batteries of Sarco Steam Traps. Each of the four types illustrated has special advantages of its own. All have the "know how" of Sarco's experience and the precision that results from being made in a plant devoted exclusively to steam traps and temperature controls.

FOR THE SMALL PLANT TOO

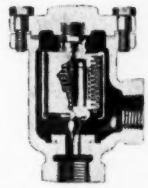
Small plants can profit by this advanced knowledge merely by asking for a Sarco recommendation. Your heating engineer or the nearest Sarco Representative can get this for you. And don't overlook the various forms of Sarco hot water, process and cooling controls.



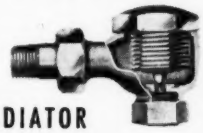
BUCKET TRAP



FLOAT-THERMOSTATIC



THERMOSTATIC



RADIATOR TRAP

240

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SAVES STEAM

SARCO COMPANY, INC.

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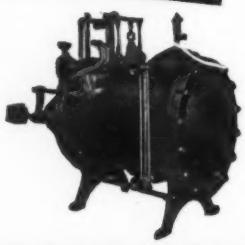
STERLING STEAM ECONOMY LIFTERS

For Pumping Condensate at LOW Operating COST

from: PIPE COILS
PROCESS MACHINES
WATER HEATERS
DRY KILNS
DRYERS, ETC.

An automatic device that stops hidden steam losses on any steam producing plant. Results shown on new or old installations.

NOISELESS! OPERATES ON EITHER STEAM OR AIR PRESSURE



Sterling Engineering & Mfg. Corp.
(Templeton Mfg. Co.)
110 Business St.,
Hyde Park, 36, Massachusetts

Looking for electric switches?

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You'll find them in your POWER Buyer's Guide Issue.

Power engineers everywhere are using their Buyer's Guides to find equipment of every description needed for efficient and economical power system operation.

The Buyer's Guide tells you *what is available, who makes it, where to buy it.*

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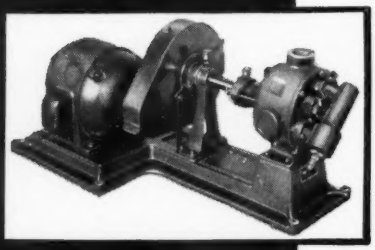
Keep and use your copy of the

POWER *Buyer's Guide*

VIKING

The Rotary Pump, Built To Create and Retain your CONFIDENCE



The building of a piece of equipment to win your confidence is the aim and purpose of every Viking that leaves the factory.

Confidence can only be *won* and *retained* with a pump that will actually go out and do the job it is sold to do.

Look to Viking for the pump that builds confidence. A self-priming, simply and ruggedly constructed pump suitable for delivery against discharge pressures.

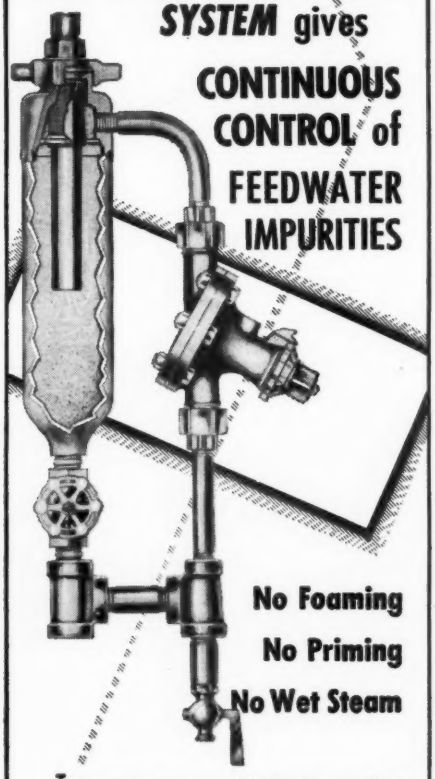
Write today for free bulletin 47SW. It will be sent immediately.

See Our Catalog In SWEETS

Viking PUMP COMPANY
Cedar Falls, Iowa

BOILER BLOW-OFF no longer HIT-or-MISS

the **MULTOMETER** *SYSTEM* gives **CONTINUOUS CONTROL** of **FEEDWATER IMPURITIES**



No Foaming
No Priming
No Wet Steam

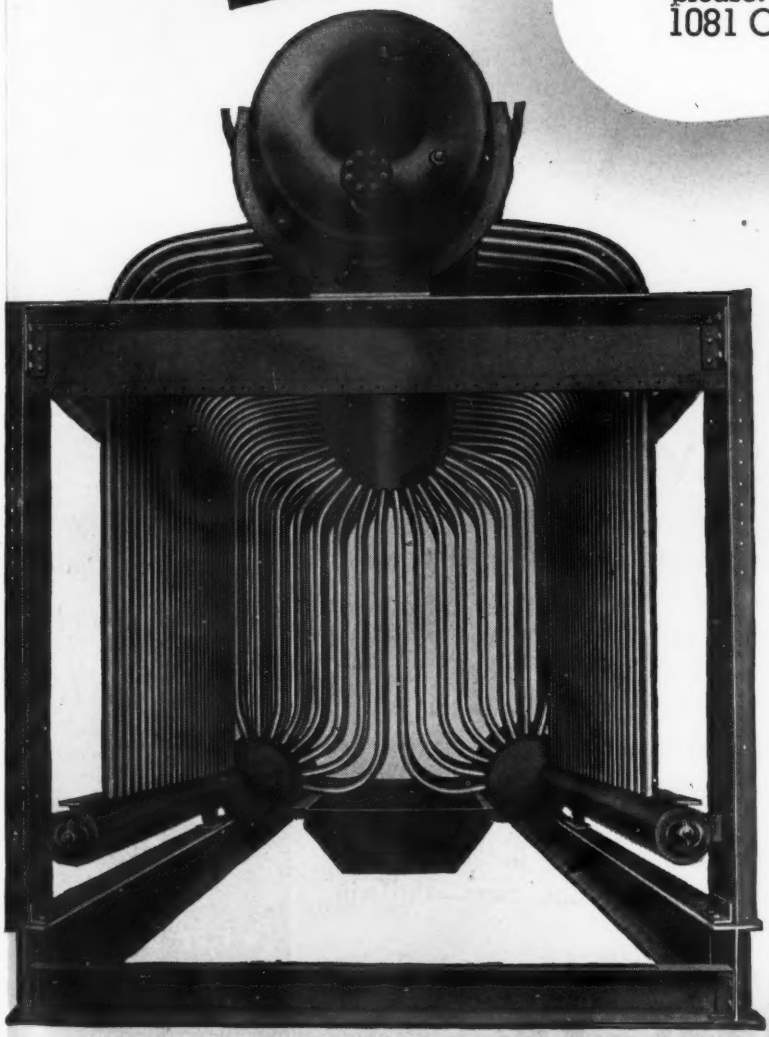
Intermittent, manual boiler blow-off is inaccurate, time-consuming, and wasteful of water and heat. The MULTOMETER is the modern, effective way to control the impurities that exist in *all* boiler waters. It is instantly adjustable to fit variations in load. It is easily installed on all boilers. It cuts working time and fuel costs. It is available in simple control units or in combination with heat reclaiming equipment. Hundreds in continuous operation for 10 years or more.

Write for illustrated, fact-filled booklet on how to keep boilers at top efficiency.

P. E. MADDEN & CO.
352 W. WALTON CHICAGO 10

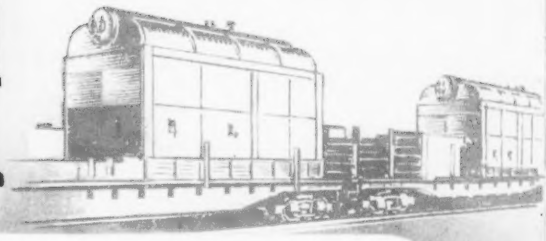
UNION OFFERS *New* BOOKLET ON *New* BOILER DESIGN

We have prepared a book illustrating the construction of our latest boiler development, the "S" type boiler. Complete engineering data is included. Request your copy of this booklet on company letterhead, please. Address Union Iron Works, 1081 Cascade St., Erie, Pa.



The UNION "S" type boiler is a compact self-contained unit complete with water cooled furnace. It can be shipped fully assembled in sizes to 300 H. P. It has narrow overall width and large furnace volume in a low setting height, providing large capacity in limited space.

You will be interested in knowing how we have designed water wall circulation without circulator connections and in many other new features.

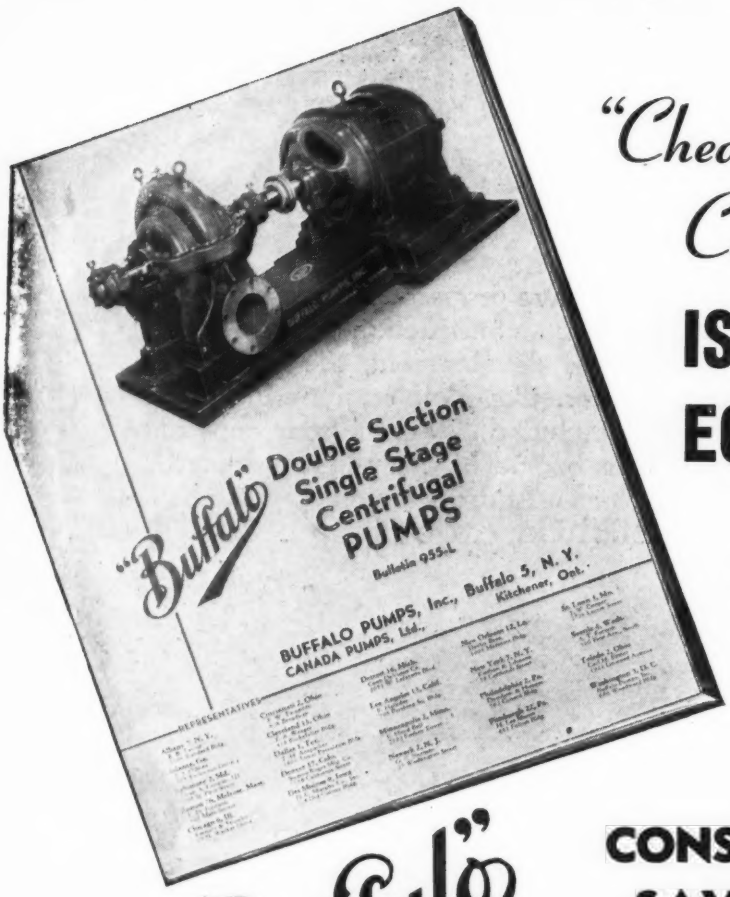


UNION IRON WORKS • ERIE, PA.

Since 1890

BOILERS — PROCESS EQUIPMENT — FABRICATED STEEL

CENTRIFUGAL PUMPS FOR EVERY LIQUID


"Buffalo" Double Suction Single Stage Centrifugal PUMPS
Bulletin 955-L
BUFFALO PUMPS, Inc., Buffalo 5, N. Y.
CANADA PUMPS, Ltd., Kitchener, Ont.

PUMPS by "Buffalo"

"Cheap" Pump Construction IS NO ECONOMY!

(Bulletin 955-L, left, tells you why — write for your copy!)

"Buffalo" CONSTRUCTION SAVES WHERE SAVING COUNTS!

—and that's in the long run! When maintenance and power costs are rock-bottom over years of heavy service—*you're saving money!* "Buffalo" Pumps are built heavily, from pump stand to impeller. Bearings and shafts are husky. Stuffing boxes are extra-deep. Materials and machining are top grade. This is not the cheapest construction but it pays off in pumping dollars! Let us send you the engineering facts—Bulletin 955-L—write now!

DOUBLE SUCTION SINGLE-STAGE CENTRIFUGAL PUMPS

- For most clear water services
- In capacities from 10 to 10,000 gpm
- Direct or pulley drive, clockwise or counter-clockwise rotation

For

- ★ WATER ANY TEMPERATURE
- ★ PAPER STOCKS (NON-CLOGGING)
- ★ GENERAL SERVICE
- ★ ACIDS
- ★ ALKALIS
- ★ SLURRY
- ★ CONDENSATE RETURN
- ★ SUMP CLEARANCE
- ★ FIRE SERVICE
- ★ SEWAGE
- ★ SELF-PRIMING SERVICE

BUFFALO PUMPS, INC.

488 BROADWAY BUFFALO, NEW YORK

Canada Pumps Ltd., Kitchener, Ont.

RUGGED, PRECISION CONSTRUCTION—FOR LONG LIFE

POWER

DEPEND ON EXIDE BATTERIES FOR DIESEL CRANKING

Exide Batteries are built specifically for the difficult job of cranking Diesel engines . . . with extra ruggedness to keep them on the job day after day.

Exide Diesel Cranking Batteries are giving a good account of themselves on trucks, buses, off-the-highway equipment, ships, railroad locomotives, in power plants and other Diesel applications. Whatever the cranking job, you can always rely on Exide Batteries for dependability, long life, economy and ease of maintenance.

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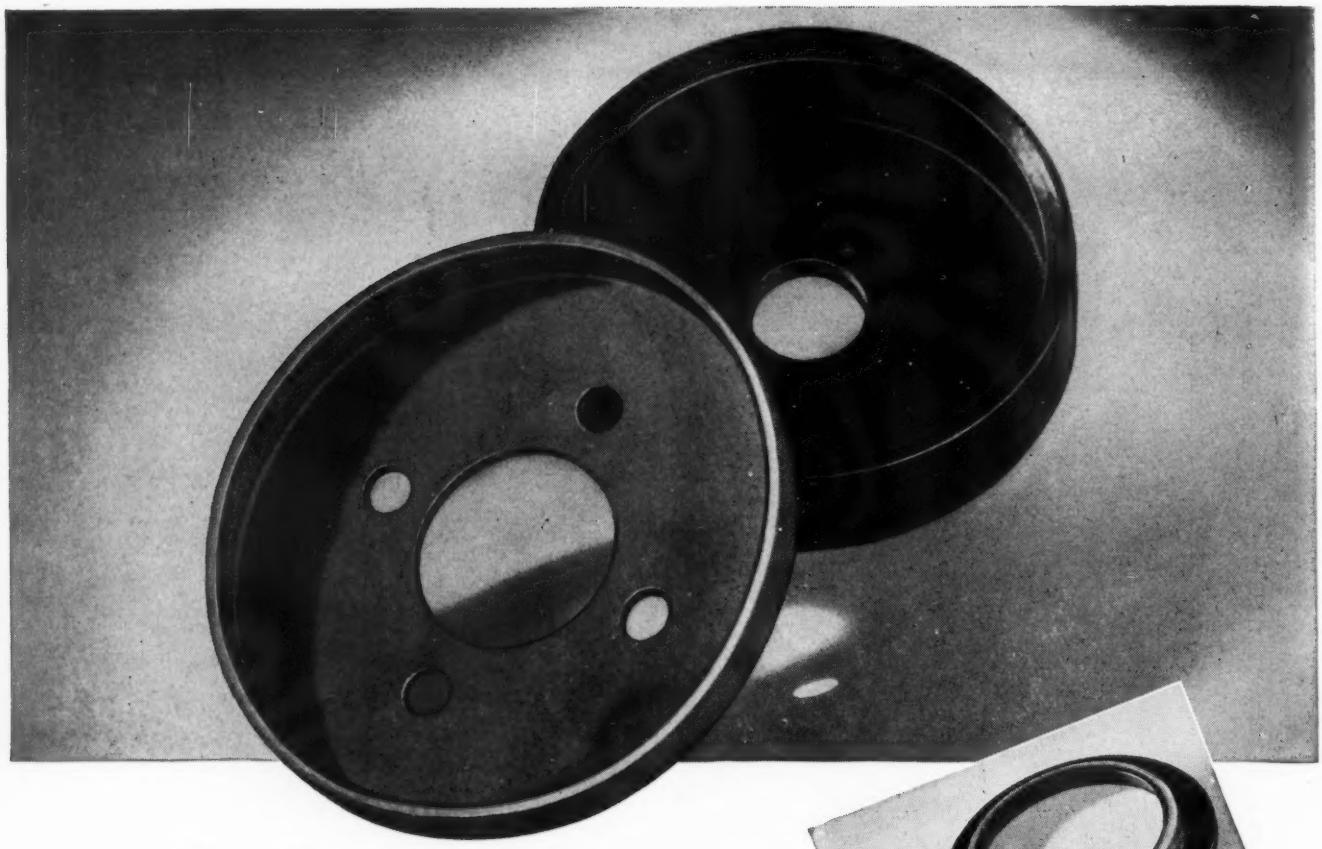
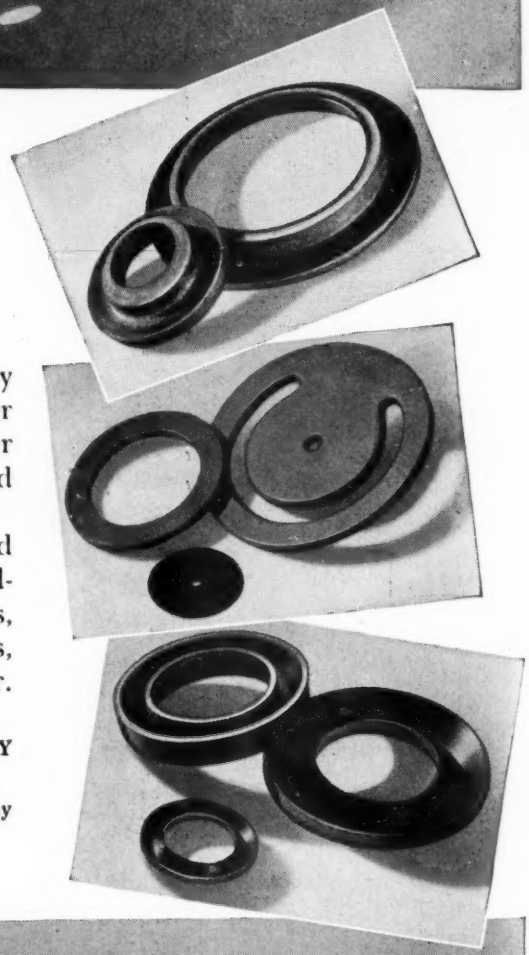
BATTERIES

1888...Dependable Batteries for 60 Years...1948

THE ELECTRIC STORAGE BATTERY CO., Philadelphia 32 • Exide Batteries of Canada, Limited, Toronto





For Severe Leather Packing Service

Garlock BITAN* Leather Packings are tanned and treated by an exclusive Garlock process for the most severe leather packing applications. They operate satisfactorily at higher temperatures and higher pressures than leathers of standard tannage and treatment.

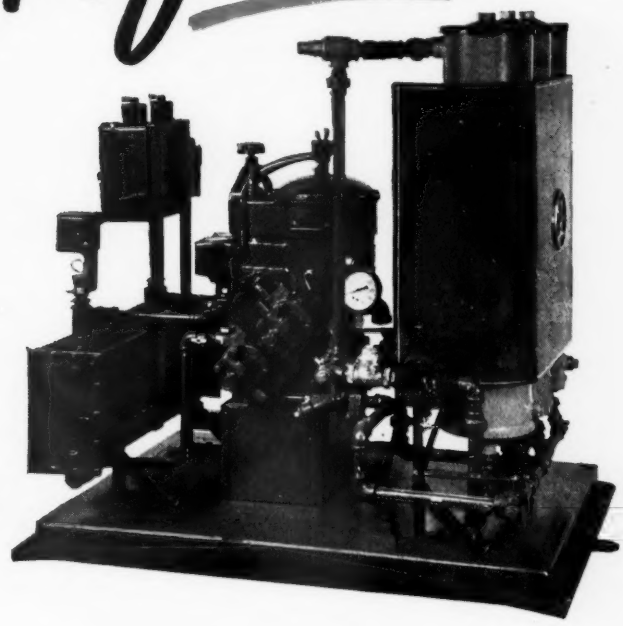
In filling each order, the leather is properly tanned and treated for the particular service for which the finished product is to be used. All types or forms including: Molded Cups, "U" and "V" Packings, Flange or Hat Packings, Gaskets, Washers, and Discs. All sizes. Write for descriptive folder.

THE GARLOCK PACKING COMPANY
PALMYRA, N.Y.
In Canada: The Garlock Packing Company of Canada Ltd., Montreal, Que.

*Reg. U. S. Pat. Off.

GARLOCK *Bitan** LEATHER PACKINGS

To Get Rid of All LUBE OIL IMPURITIES_



TO remove ***all three*** major contaminants of Diesel lubricating oil, use the De Laval "Puri-Filter." The first two, dirt and water, are separated from the oil by De Laval Centrifugal Force, as embodied in the bowl of the De Laval Oil Purifier. The water is discharged continuously from the Purifier bowl. The third—colloidal carbon—is filtered out of the purified oil by Fram Filters.

The De Laval "Puri-Filter," which is a combination of De Laval "Uni-Matic" Oil Purifier and Fram "Filcron" Filters, gets rid of all solid impurities down to one micron in size. It likewise keeps the oil completely free of moisture. It is therefore the most effective means ever devised for protecting Diesel engine bearings.

Write for Bulletin DL-1 which gives additional details on Diesel oil purification.

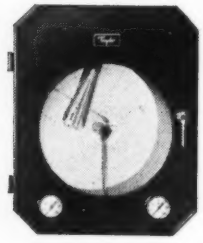
THE DE LAVAL SEPARATOR COMPANY
165 Broadway, New York 6 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5
THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

DE LAVAL OIL PURIFIERS

FOR DIESEL LUBRICATING OIL

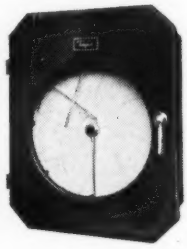
RECORDING FULSCOPE CONTROLLER

For desuperheaters, or for any close, accurate control of temperature, pressure, flow or liquid level. Quickly adapted to any operating requirements.



RECORDING THERMOMETER OR PRESSURE GAUGE

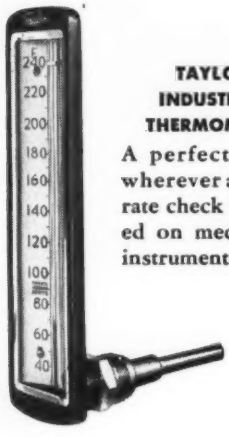
Accurately records steam and feed water temperatures and pressures or oil, air and flue gas temperatures. Dependably accurate *wherever* you need a record of pressure and temperature.



TAYLOR DIAL THERMOMETER

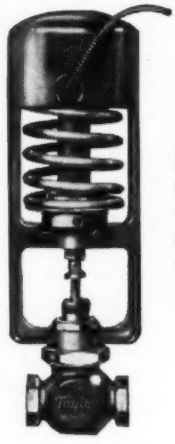
For transformers, coal-air mixture in powdered coal ducts, air compressor discharge, turbine and generator bearings. Available with electric alarm devices.

How to be Instrumental in saving your company money



TAYLOR INDUSTRIAL THERMOMETER

A perfect choice wherever an accurate check is needed on mechanical instruments.



TAYLOR SELF-ACTING CONTROLLER

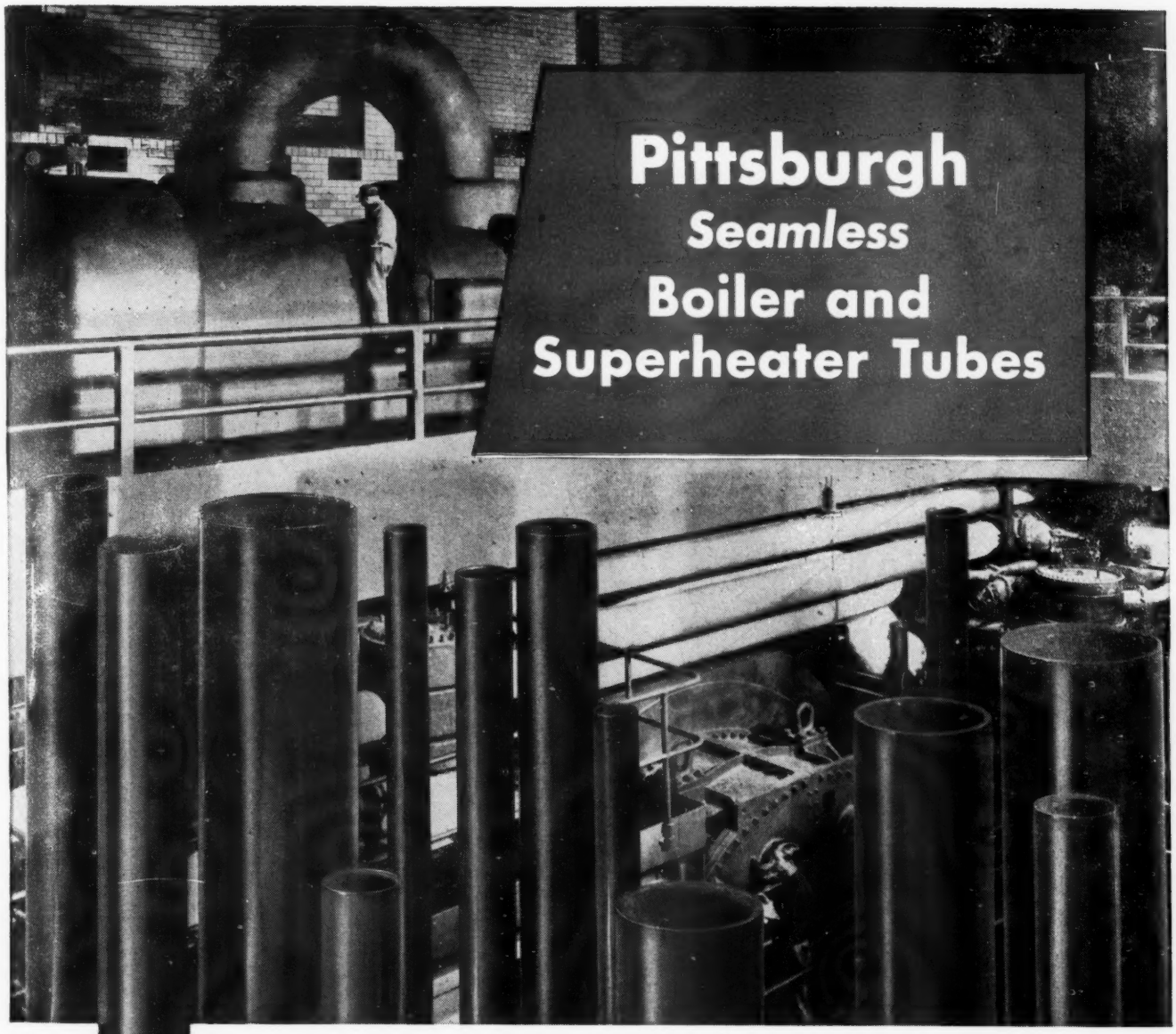
For dependable temperature control on hot water storage tanks, air compressor jacket water.

ARMORED ETCHED STEM THERMOMETER

Ideal wherever you need a test check on temperatures. Also available in unarmored types.

MAYBE no man can be a hero to his boss. But instruments like these *will* help you get credit for increasing operating efficiency and cutting costs. Of course, they're only a few of the complete line we can offer you for better measurement or control of temperature, pressure, flow or liquid level. Ask your Taylor Field Engineer! Taylor Instrument Companies, Rochester, N.Y., or Toronto, Canada.

Taylor Instruments
MEAN
ACCURACY FIRST
IN HOME AND INDUSTRY



Many operators find the long service and ease of installation of Pittsburgh Seamless Boiler Tubes give them *extra* economy in their boiler and superheater units. The carefully controlled chemical and physical properties and the wall strength inherent with seamless tubes give you trouble-free installation and long satisfactory service. Pittsburgh Seamless Boiler Tubes are produced in carbon and alloy grades. Pittsburgh Steel Company, 3270 Grant Building, Pittsburgh 30, Pa.

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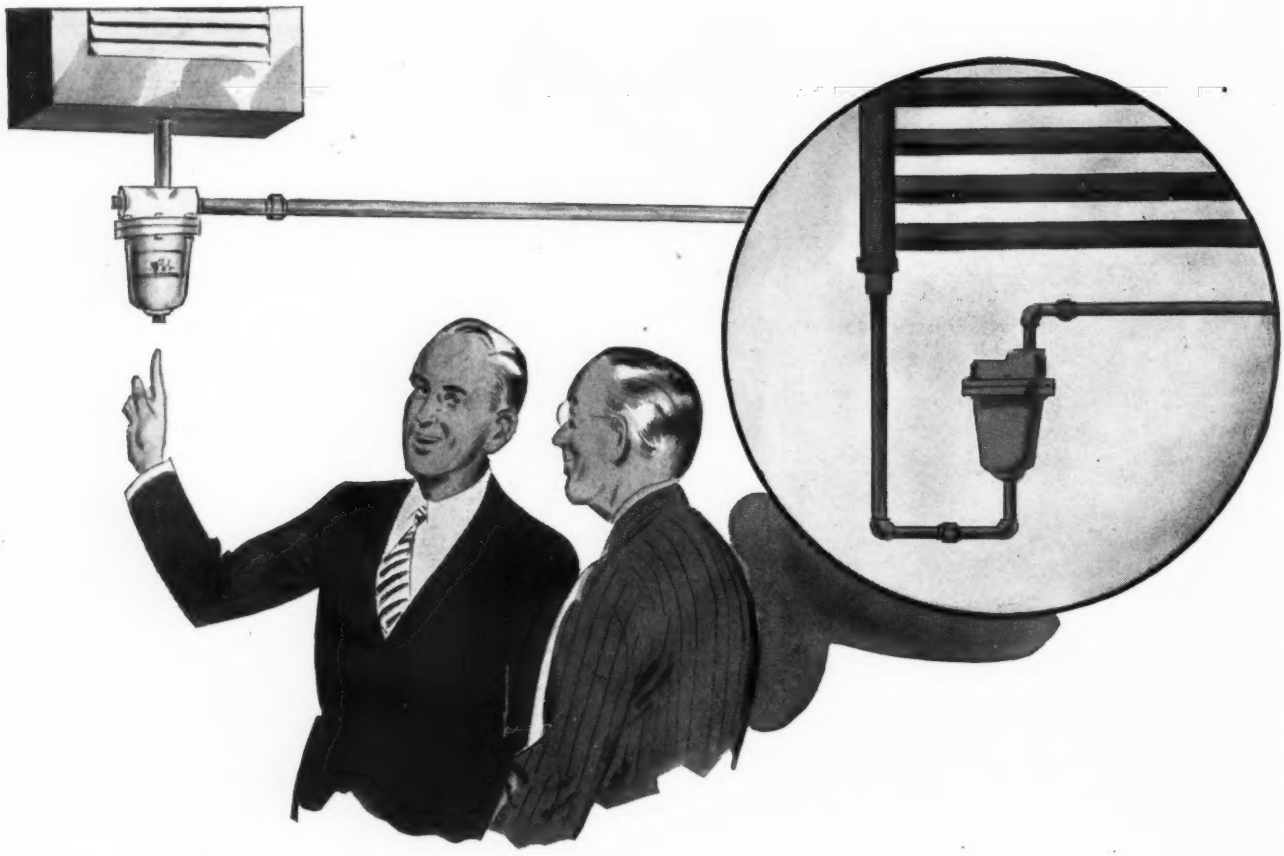
Pittsburgh Steel Company



*But **NOW** we simplify with*

SUPER-SILVERTOP

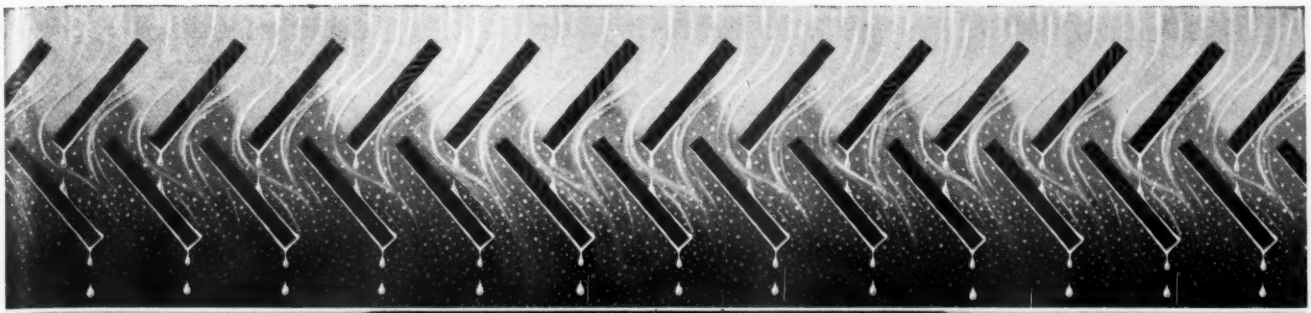
"Habits are hard to break, but we finally stopped our *confusion-piping* habit and now we simplify all our steam trap piping by using Anderson Super-Silvertops. We save as many as 9 fittings and 60 minutes of installation time per trap this way. Do you wonder that we made the change?"

You too will make such savings by changing to Super-Silvertops. These steam traps led the field in the change to clean-cut piping and are still the only steam trap that provides elbow *or* straight-in-line connections in every trap, in every size including the steel series traps.

Long life, easy to inspect, high capacity, no parts problem, no flopping bucket are other reasons for Super-Silvertop popularity. Get the whole story now—send for your copy of the book, "How To Choose A Steam Trap." Contains helpful hints, tables, charts; sent free on request. Write.

THE V. D. ANDERSON COMPANY
1934 WEST 96TH STREET • CLEVELAND 2, OHIO

USE SUPER-SILVERTOP
Straight-in-line or as an elbow



Wind Maker, Not a Rain Machine

Custom design and careful, experienced engineering of C. H. Wheeler Induced Draft Water Cooling Towers assures minimum water loss, this principally by natural evaporation. Offset Herringbone Drift Eliminators catch all but an imperceptible trace of moisture in the air, thus no mist falls on the landscape adjacent to the tower. Drawing above illustrates how they work. Air passing thru layers of blades changes direction and deposits moisture on the underneath side; this builds into drops and falls downward into the towers. . . . Catalog No. 145 gives other reasons why C. H. Wheeler Towers are used all over the United States and in foreign countries. Write for it today.

C. H. WHEELER MFG. CO.
1800 SEDGLEY AVE., PHILA. 32, PA.
REPRESENTATIVES IN MOST PRINCIPAL CITIES

C.H. Wheeler OF PHILADELPHIA

STEAM CONDENSERS AIR EJECTORS
COOLING TOWERS · HEAT EXCHANGERS

R/M rubber sheet packing

R/M makes a complete line of rubber sheet packings, designed to meet operating conditions in chemical and oil processing plants where high temperatures prevail, as well as general purpose rubber sheet packings for cold-water service at low pressures.

R/M Red Rubber Sheet Packing, No. 625, is one of the most popular sheets. It is made of long-lasting, tough red compound that conforms to rough surfaces. Recommended for air, cold or hot water, and steam up to 150 pounds.

Resilient Flexlastic Sheets for cold water, low pressures, general service and for pipeline gaskets are supplied in three different styles . . . "C. I." Sheet, No. 635, with one ply of cloth for each 1/16" of thickness . . . "C. O. S." Sheet, No. 638, same as No. 635 but reinforced with an additional ply of fabric on one side . . . and "C. B. S." Sheet, No. 641, same as No. 635 but reinforced on both surfaces.

R/M Diaphragm Sheet, No. 645, for damper regulators, is a high-tensile, square-woven duck covered with Flexlastic, compounded to resist air, water, steam and oil.

These specialized sheet packings are typical of the many packings of all types which your authorized R/M distributor can supply to meet the packing needs in your plant. Call him today for reliable packing service.

R/M

RAYBESTOS-MANHATTAN, INC.

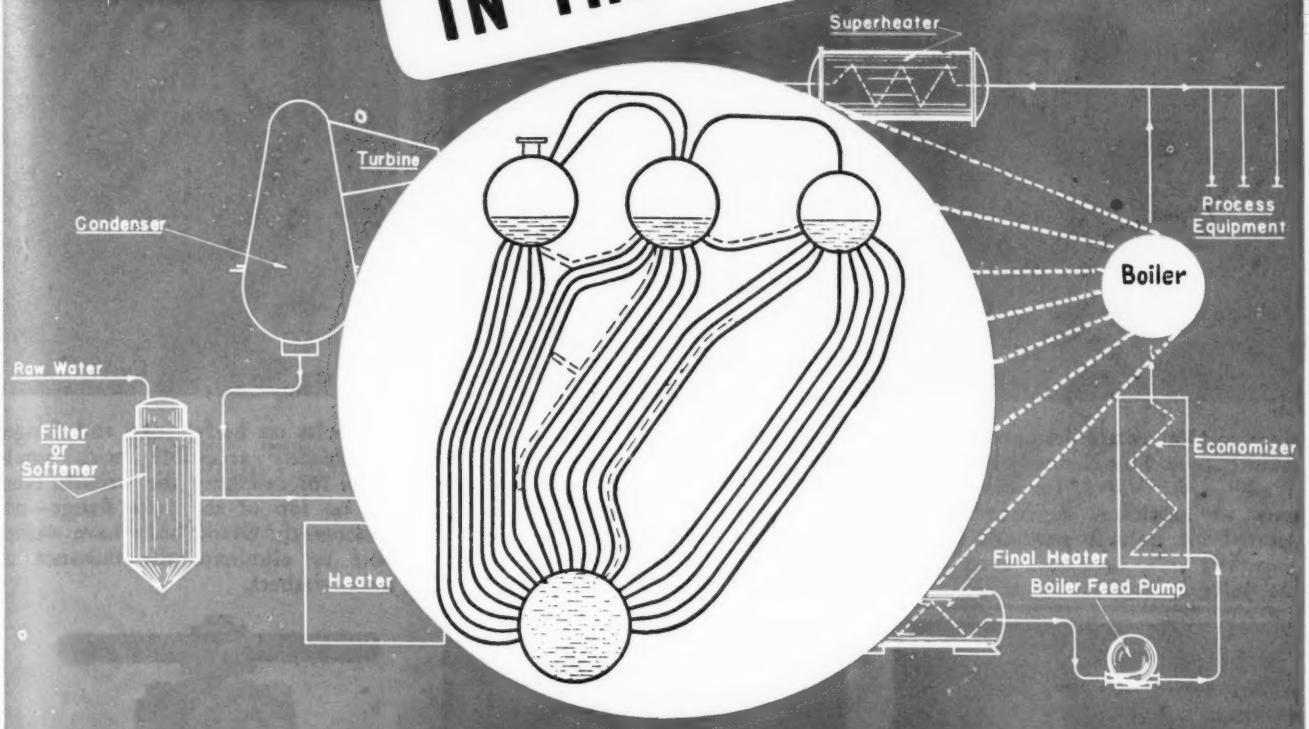
ASBESTOS TEXTILE & PACKING DIVISION

MANHEIM, PA. • BRIDGEPORT, CONN. • NORTH CHARLESTON, S. C. • PASSAIC, N. J.

We also manufacture a complete line of Asbestos Textiles, Friction Materials, and Industrial Rubber Products.

IS YOUR PLANT OPERATION SUFFERING FROM WATER TREATMENT PROBLEMS . . .

IN THE BOILER?



● High maintenance costs and serious production delays are often caused by scale, sludge, corrosion, carryover and other difficulties resulting from boiler feedwater.

Scale and sludge result largely from hardness in the boiler feedwater. More recently attention has been directed towards iron and copper deposits.

Corrosion is usually caused by the presence of dissolved oxygen and low boiler water alkalinity. Special cases involve attack by high alkalinity, particularly in low circulation areas.

Carryover is generally the result of excessive concentration of solids in the boiler water. Contributory factors are high suspended solids, high alkalinity and contaminants, such as oil or process materials.

Corrective measures may range from simple chemical or mechanical adjustments to more complicated procedures, depending upon the extent and seriousness of the individual problems.

Some of these difficulties are probably present in your plant. They require intelligent diagnosis and recommendations for corrective measures. Your local Drew engineer will be glad to call and discuss any phases of water treatment without obligation.

POWER DREW CHEMICALS

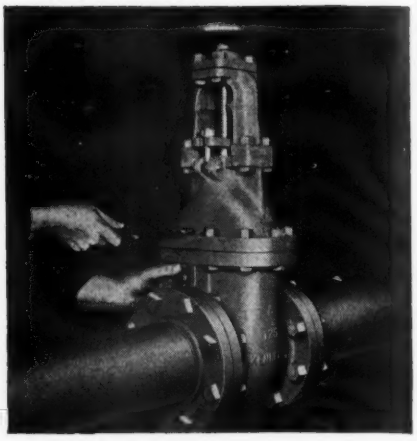
E.F.DREW & CO. INC.
15 E. 26th ST., NEW YORK 10, N. Y.
Representatives in all key cities

BOILER WATER TREATMENT
COOLING WATER CONDITIONING

MAINTENANCE IS EASY
when you use Kennedy Valves

Kennedy Valves are designed for easy maintenance. This Kennedy Iron-Body Wedge Gate Valve, for example, is easy to lubricate. A conveniently-located oil hole is provided in the yoke cap . . . accessible even when the valve is closed.

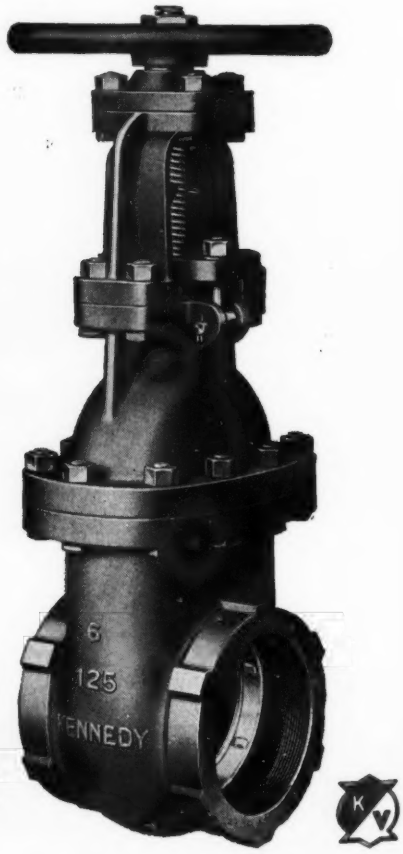
Repacking the gland is easy, too. Gland bolts need only be loosened and swung out, and the packing gland lifted on the stem and rested on shelves inside the yoke, out of the way. It may be packed under pressure when valve is wide open.



All bolts on body, yoke and flanges are readily accessible, with ample room for swinging the wrench. Nuts are on top of the yoke flange—not underneath. Gland bolts have washer nuts to eliminate the nuisance of loose washers.

On screwed end valves, lugs are provided around the outside of the end connections for convenience in applying a pipe or chain wrench.

Operation of the valve, too, is easy. The large-diameter hand-wheel provides ample leverage for effortless opening and closing of the valve.



The Kennedy Iron-Body Wedge Gate Valve is only one of hundreds of Kennedy Valves, all designed for minimum maintenance, easy operation, and long service life. For details see Kennedy's 240-page Catalog.

THE KENNEDY VALVE MFG. CO., ELMIRA, NEW YORK
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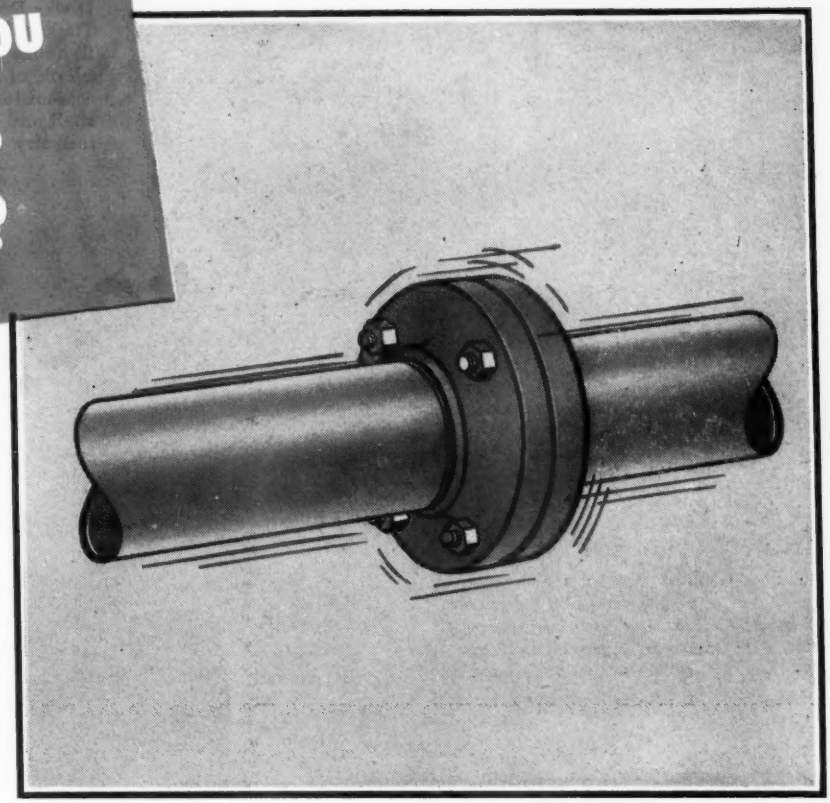
XV-175

KENNEDY valves - pipe fittings - fire hydrants

How would you insulate this steam line?



A newly installed line carrying steam at 650° F. is subject to severe vibration from near-by traffic. Because of the high temperatures in the line, it should be insulated as soon as possible. On flanges the insulation must be removable. Which of these materials would you select?

- [ ] 1¼" high temperature and 1½" 85% Magnesia pipe covering
- [ ] 2" Bestfelt pipe covering

Here's what the Armstrong Engineer recommended:

On this particular job, either of the two specifications is adequate for the 650° F. temperature involved. However, there were other factors that led the Armstrong engineer to recommend Bestfelt on the line and flanges.

Not only is 2" of Bestfelt less expensive than the combination covering but, under severe vibration conditions, Bestfelt will not crumble or crack. Because of its toughness and flexibility, Bestfelt can be used for removable flange covers without a framework of hardware cloth. And today, it can be delivered more promptly than combination covering.

Bestfelt is made of layers of finely crimped asbestos paper—about 33 laminations per inch of thickness. Its efficiency is somewhat better than combination covering, making a 2" thickness of Bestfelt practically as effective as almost 3" of combination covering.

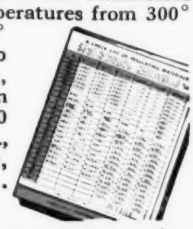
★ ★ ★

In designing a piping layout, the architectural engineer has plenty of problems without concerning himself with the fine details of insulation specifications. There's one man whose job calls for making these fine distinctions. He's the Armstrong engineer. His long experience helps him foresee the conditions under which insulation must operate. His suggestions at the planning stage can save you time, trouble, and dollars.

This engineering "know-how" is just one of the advantages of Armstrong's nation-wide contract service. The complete service includes proper insulation materials and also the expert workmen to install them. Next time you have a heat insulation job coming up, call Armstrong's nearest district office for an estimate.

FREE INSULATION CHART

This chart lists types and thicknesses of insulation for temperatures from 300° below zero to 2800° F. Write today to Armstrong Cork Co., Industrial Insulation Department, 7010 Maple Ave., Lancaster, Penna.



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Dodge develops *outstanding* power transmission products, as proved by the big success of Dodge-Timken Bearings on millions of industry's toughest jobs.

Dodge-Timken Bearings are supplied promptly from stock in four basic types and a wide range of sizes to meet an almost limitless variety of anti-friction problems.

Dodge also produces Ball Bearing Pillow Blocks which, with Dodge-Timken Bearings, comprise the famous "30,000 hour line." Write for complete bulletins.

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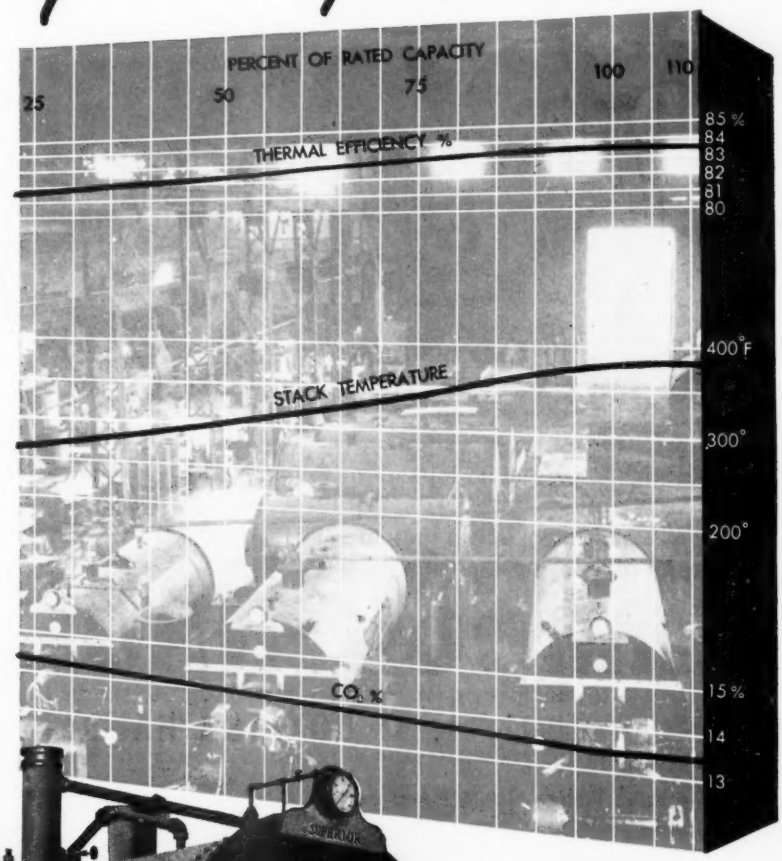
Superior Steam Generators are better designed, better made . . . results prove it.

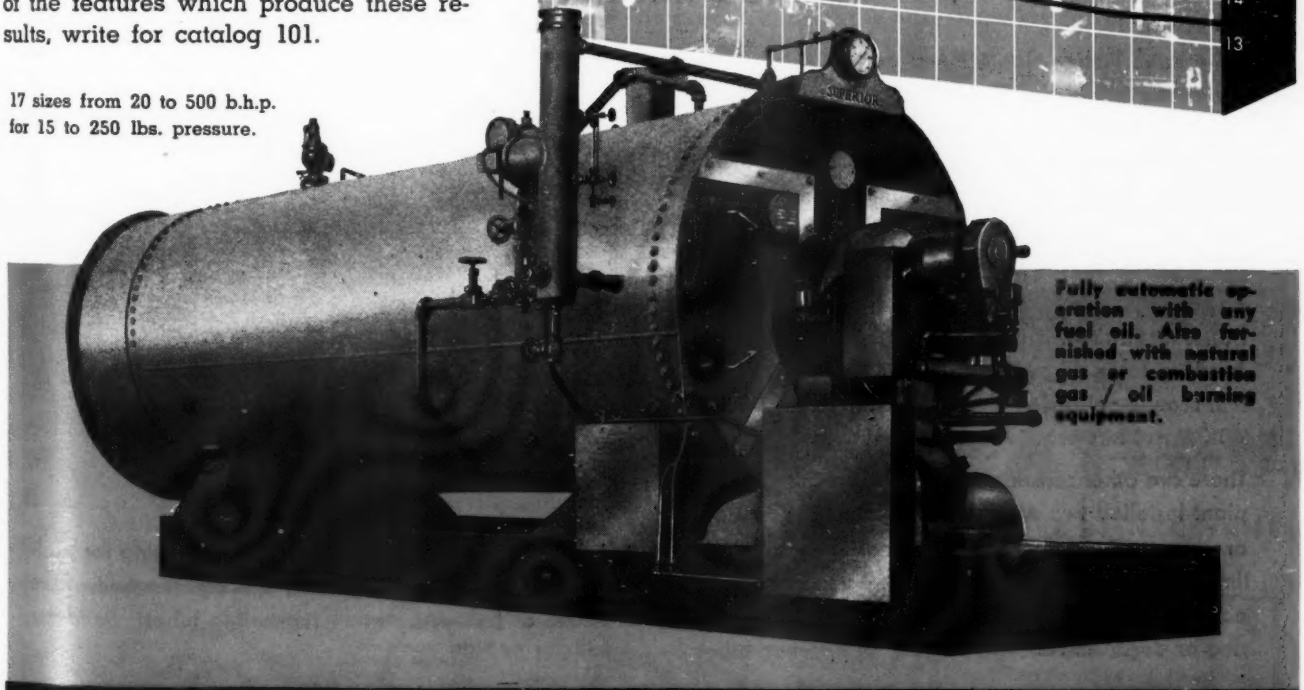
The accompanying graph tabulates the actual data recorded during recent tests performed on a Superior Steam Generator which has been in operation a full year. Professors Jackson and Holme of Lehigh University made the tests and recorded the data from instruments supplied by their university.

Note the high efficiencies developed over a firing range which varies from 25% to 110% of rated capacity . . . and these tabulations take *everything* into account . . . even the small water content of the steam was deducted from the thermal efficiency.

These high efficiencies spell savings in fuel and operating costs. For details of the features which produce these results, write for catalog 101.



17 sizes from 20 to 500 b.h.p. for 15 to 250 lbs. pressure.



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Factory: Emmaus, Pa.

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LESS WEAR ON PARTS

AMSCO-NAGLE PUMPS

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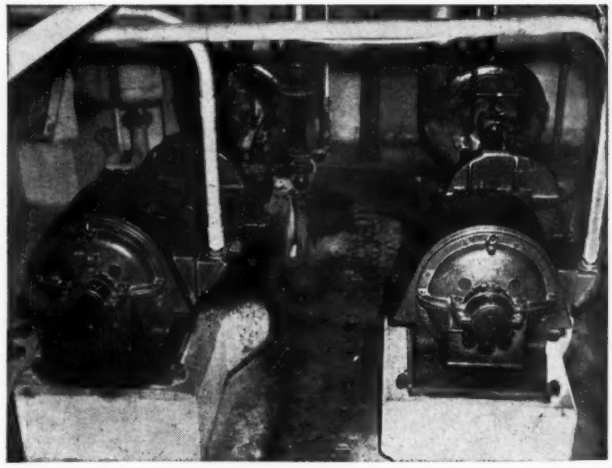
Only three Amsco-Nagle Pump parts are subjected to the brutal punishing of furnace ash and slag as it is drawn from the power plant sump and delivered to the disposal area. *That's less parts to wear!* The anti-friction bearings are completely sealed off from the water end.

The three parts—end plate, impeller, and casing—are made of Amsco Manganese Steel. *That's less wear on parts!* "The toughest steel known" takes the roughest battering without fracturing . . . polishes and work hardens to as high as 550 Brinell to fight abrasion. (For scouring abrasion without shock stress, Brake Shoe's ABK Metal has proved highly economical.)

There are other reasons why this North Carolina power plant installed two Amsco-Nagle pumps. When repairs are eventually necessary, they're easier, less costly, less time-consuming. Parts are simplified and accessible for easy maintenance. End plate attaches with clamping ring or dogs. Impeller screws on. Supporting tubes on



water end slip into sleeves on bearing housing for positive alignment. Stuffing box quickly reached, from above or below, between supporting tubes. Send for Bulletin 547-IP.

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AMERICAN MANGANESE STEEL DIVISION
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Foundries at Chicago Heights, Ill., New Castle, Del., Denver, Colo., Oakland, Calif., Los Angeles, Calif., St. Louis, Mo.
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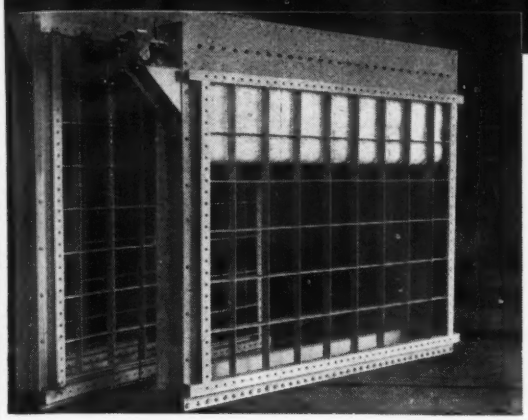
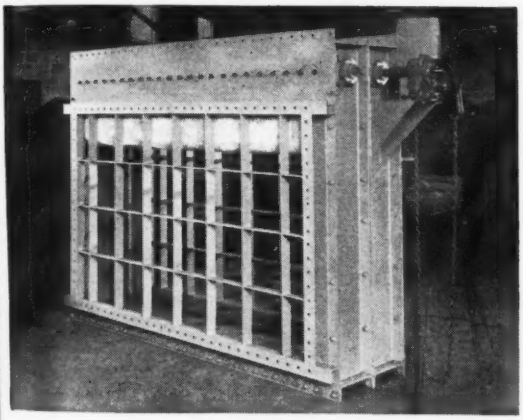
for single direction flow . . . or reverse flow control . . .



SVH Type Heacon Damper regulates flow in one direction.



DVHR Type Heacon Damper regulates flow in either direction. Note double grill against which two curtains ride.

HEACON DAMPERS handle both!

Illustrated on this page are two types of the most widely used dampers. The SVH (single curtain—Vertical damper—Horizontal duct) and the DVHR (double curtain—Vertical damper—Horizontal duct—Reversing flow).

These types answer most damper requirements and, although tailor made to the application, they are considered the basic Heacon Damper design.

The Heacon Damper is unique in design. Sealing off and control of gases is accomplished by means of a flexible curtain of steel, asbestos, rubber or canvas, depending on application. This curtain operates vertically and is held against the grille and seals by the flow. As the curtain is rolled up, opening the damper, it peels from the grill. This action relieves the operating spindle of all torque, and permits the use of a constant, moderate power for operation.

Flow curve of the Heacon Damper may be modified to almost a straight line by means of V-porting. This is particularly important when the damper is to be used as a control mechanism. Some advantages of the Heacon Damper are: Better Regulation, Increased Capacity, Appreciable Reduction in Maintenance, Lower Banking Losses and Constant Power Requirements for Operation.

Let our engineers assist in solving your damper problems. A call or letter will bring you our Heacon Bulletin No. 10.

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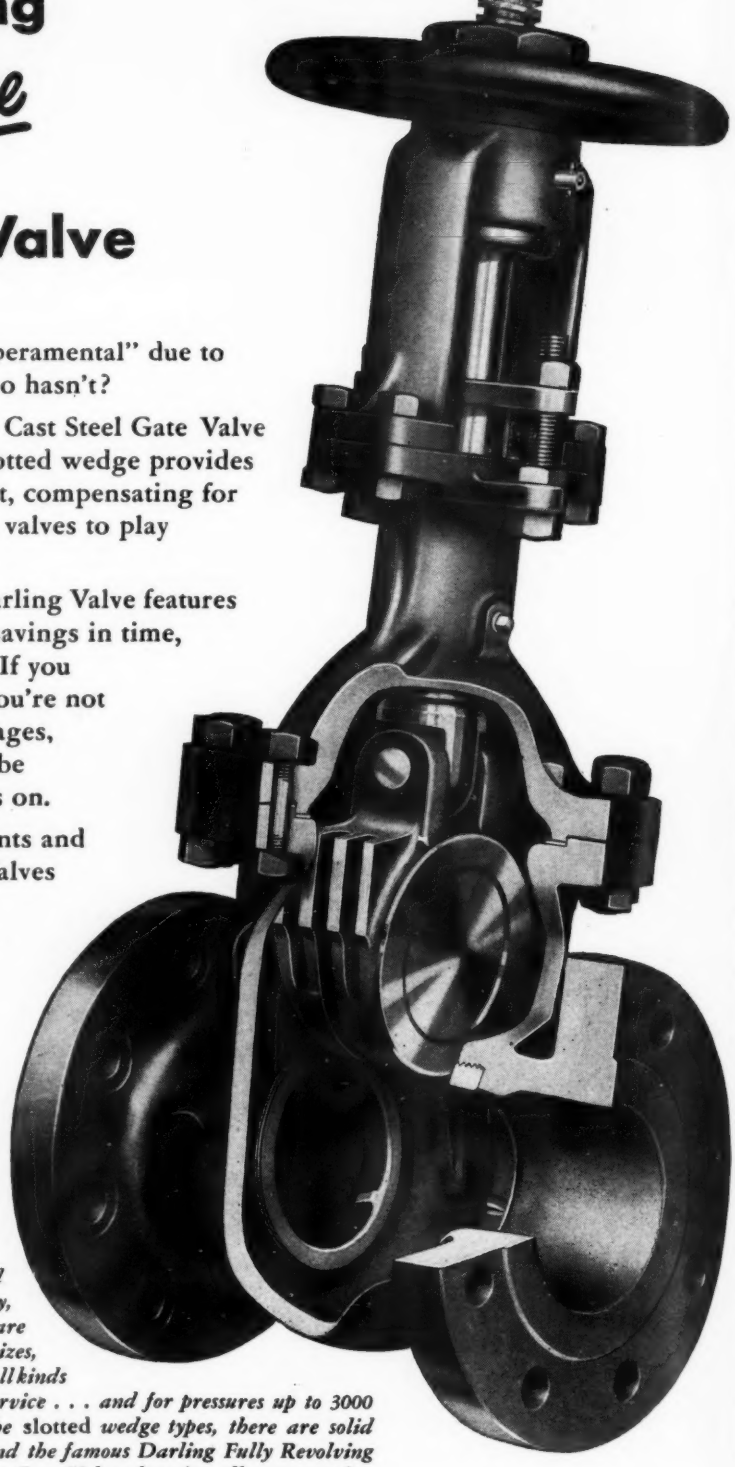
WON'T "PLAY TRICKS" ON YOU!

It's the Darling *Slotted Wedge* Cast Steel Gate Valve



YOU'VE probably had valves "go temperamental" due to temperature or pressure changes. Who hasn't?

The Darling *Slotted* Wedge Taper Seat Cast Steel Gate Valve licks such trouble once and for all! Its slotted wedge provides *flexibility* when and only when you need it, compensating for those conditions that encourage ordinary valves to play costly, time-wasting "tricks".

This is only one of *many* distinctive Darling Valve features . . . advantages that add up to important savings in time, maintenance and over-all operating cost. If you are not already using Darling Valves, if you're not thoroughly familiar with *all* these advantages, let us give you complete information. Maybe it will pay you big dividends as time goes on.

Simply outline your service requirements and get specific data on the proper Darling Valves . . . or, send for the complete 300-page Darling Catalog No. 17M. It describes Darling Valves of *all* types and is full of information of general value.

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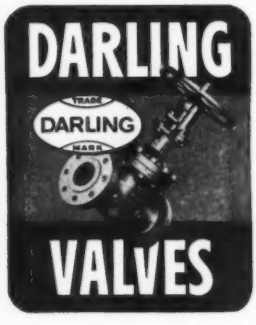

Darling Gate Valves, noted for outstanding quality, strength and precision, are made in a wide range of sizes, types and constructions for all kinds of normal and unusual service . . . and for pressures up to 3000 pounds. In addition to the slotted *wedge types, there are solid wedge taper seat valves and the famous Darling Fully Revolving Double Disc Parallel Seat Gate Valves for virtually any service.*

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LOW OPERATING COST FOR SMALL BOILER INSTALLATIONS

—here's how!

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1 Design combustion equipment and boiler setting for the range of coals economically available.

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3 Install automatic controls, smoke consumers and fly ash separators for efficiency and nuisance elimination.

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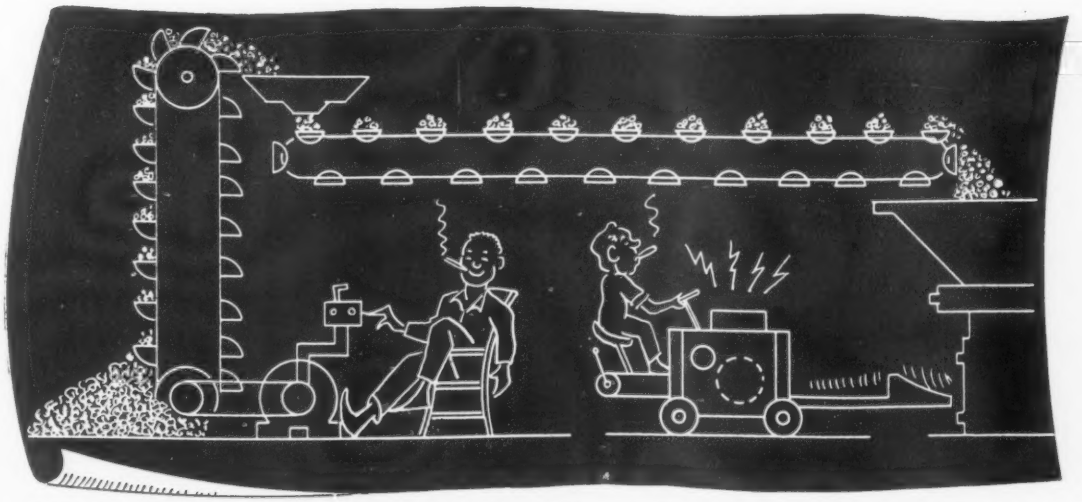
● *Material handling engineers did* ***NOT*** *design this one . . .*



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Two typical Shaw contracts—Permian Basin Plant of Texas Electric Service Co. and the Alexandria Station of Braddock Light and Power Co.—both featured editorially in this issue.

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Being engineers as well as manufacturers, E. B. Badger and Sons Company has consistently improved Badger Expansion Joints to meet industry's increasingly severe requirements.

Today, only Badger Packless Corrugated Expansion Joints offer this exclusive combination of features:

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3. *"Packless" construction* to eliminate packing maintenance and servicing.

4. *Compactness* so that Badger Expansion Joints require no more space than a regular flanged fitting.

5. Special heat treatment during the process of manufacture to increase resistance to flexing stresses and lengthen the life of the joint.

Badger Expansion Joints are made in copper, stainless steel and other alloys, with rings (Self-equalizing) or without rings (Non-equalizing), depending upon requirements. For details, send for Bulletin No. 100 (Self-equalizing) or No. 200 (Non-equalizing).

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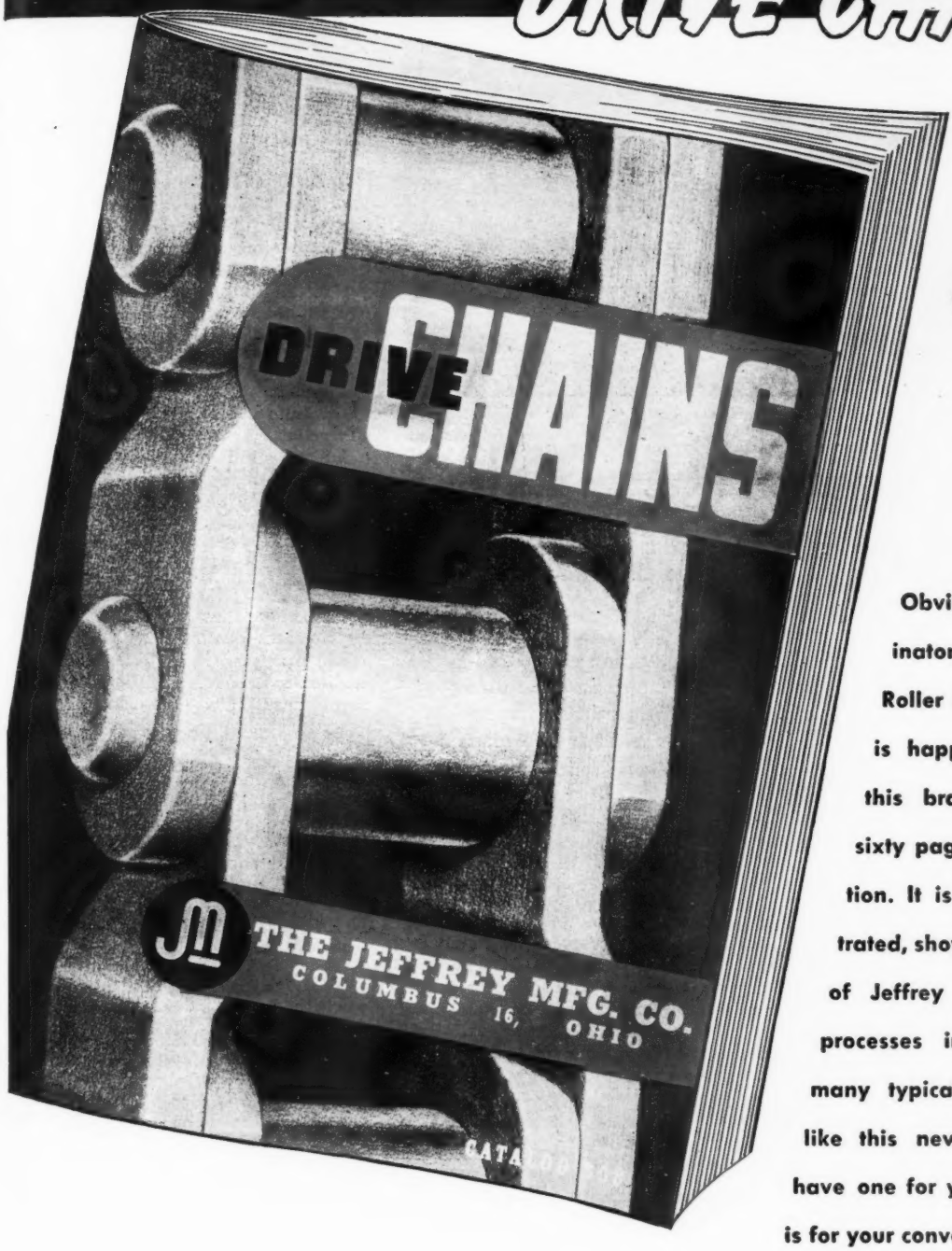

Obviously, being the originator of the Steel Thimble Roller type of chain, Jeffrey is happy to present to you this brand new book with sixty pages of useful information. It is also profusely illustrated, showing the complete line of Jeffrey STR chains, various processes in chain-making and many typical applications. You'll like this new catalog . . should have one for your files. The coupon is for your convenience.

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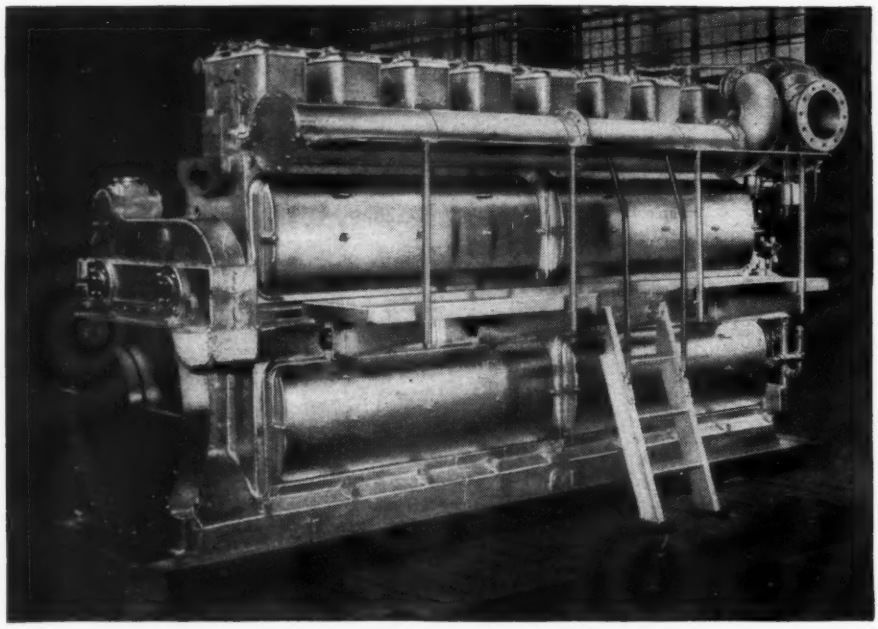

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■ The ALCO Diesel Plan is based on ALCO Standardized diesel engines, and offers great economies of construction and operation where multiples of 540 to 1,300 horsepower can be used. The same basic unit provides this wide power range by modifications which permit supercharging. The many advantages of the ALCO design and ALCO plan result in the following economies.

Low First Cost...Because this famous design is also used, with slight modifications, in ALCO switch engines, quantity production brings both first cost and the cost of replacement parts unusually low.

Low Housing Cost...The small physical size and high power-to-weight ratio of ALCO engines means foundations can be smaller and the building space required for housing the engines much less than for engines of lower power-to-weight ratio. The present high building costs make this an important advantage. Together with the low first cost of ALCO engines, the low housing cost means that amortization can be held to a relatively low figure.

Flexibility...The use of one size of engine gives plant operators wide range plus the ability to fit fluctuating load curves more closely than could be done with fewer engines of larger size, or of varied capacity.

Less Wear...This more efficient use of engines means that less wear per installed horsepower is necessary. It will almost always be possible to utilize a lesser portion of the total installed capacity against a given load demand, and the unused portion of *operating* capacity need not at any time exceed about the rating of one engine, with no wear on the idle units. Larger engines would necessitate greater wear per installed horsepower, with resulting higher costs.

Greater Efficiency...With engines operating near rated load, efficiency is greater, fuel consumption less, and better operating conditions are maintained.

Uniform Engine Wear...With several units of the same size, engines can be operated in rotation, thus keeping wear approximately the same in all engines, and allowing a planned program of inspection and maintenance with minimum "down time" and inconvenience.

Stand-by Economy...When all units are the same size, stand-by capacity can be limited to one engine. With a variety of engine sizes, stand-by capacity must equal the largest single unit.

Simplified Maintenance...Uniform engine size means uniformity of replacement parts; uniformity of maintenance and inspection procedures; interchangeability of many parts; smaller stocks of replacement parts; minimum cost of special tools and equipment; and shorter "down time."

Easy Growth...As demand increases, gradual growth can take place by adding extra units of the same size. Where non-supercharged engines are used in the initial installation, increases can be made without changing foundations or building by substituting supercharged engines of the same dimensions.

What About Speed?

Wear...Much has been said about diesel-engine speed versus maintenance. But in actual practice, slow-speed engines and medium-speed engines of the same horsepower rating have almost the same piston-travel and journal-travel per minute.

Thus it seems obvious that wear problems should be very similar—with speed having little influence.

Economy of Space...The space-saving advantage of a medium-speed engine is more than ordinarily important today because of the high cost of buildings—including foundations.

How Much Can You Save?

By using the ALCO plan, and standardizing on ALCO low-cost engines, you can very likely make substantial savings as compared to other approaches to your problem.

What your actual savings can be with these compact, efficient engines should be computed carefully. Call in an ALCO engineer to discuss the ALCO plan in relation to your needs.

ALCO STANDARDIZED DIESEL ENGINES

American Locomotive

Alco

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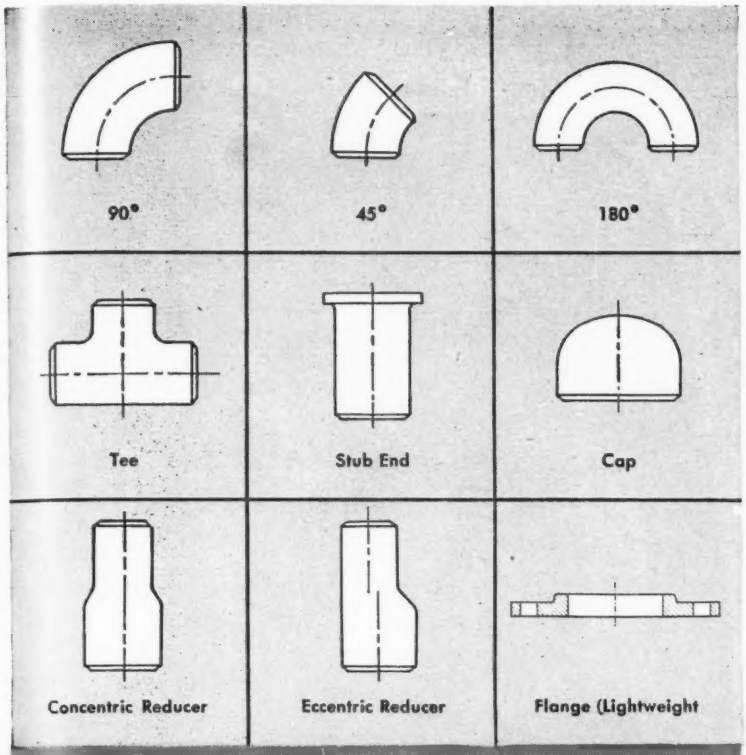
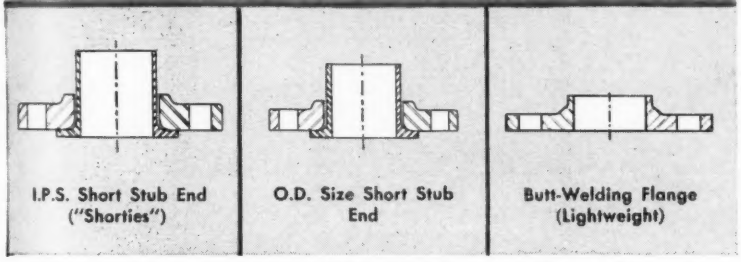


A NEW SLANT ON FLANGED CONNECTIONS



Seamless stub ends for 10-S and 40-S piping with 150 lb. A.S.A. carbon steel lap joint flanges.

Seamless stub ends for O.D. tubing sizes with 150 lb. A.S.A. carbon steel lap joint flanges.

Lightweight stainless flanges (125 lb. American Standard diameter and drilling) for butt-welding to Schedule 10-S pipe.

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UNIFORMLY EXCELLENT

. . . . for conditions requiring:
Product Purity
Corrosion Resistance
Extremely High Temperatures
Extremely Low Temperatures
Maximum Economies

Available in Stainless 304, 316, 347, Monel, Inconel, Nickel, Copper; also other usual industrial metals.

Fitting sizes: ¾" through 12" and larger. Wall thicknesses: schedules 40S, 80S, 10S and others. Flange sizes: ¾" through 30" and larger.

TAYLOR FORGE

TAYLOR FORGE & PIPE WORKS General Offices & Works: Chicago 90, Ill. (P. O. Box 485) Eastern Plant: Carnegie, Pa.
District Offices—New York: 50 Church Street • Philadelphia: Broad Street Station Bldg. • Chicago District Sales: 208 S. LaSalle Street
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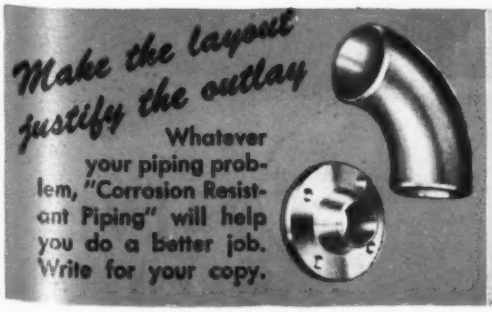

Make the layout justify the outlay
Whatever your piping problem, "Corrosion Resistant Piping" will help you do a better job. Write for your copy.

Send me "Corrosion Resistant Piping"

Name_____

Position_____

Company_____

Street Address_____

City_____ Zone_____ State_____

501-1048

Mail to Taylor Forge & Pipe Works
P. O. Box 485, Chicago 90, Illinois

EASIER and QUICKER OPENING and CLOSING

Another reason why

OIC

SETS THE PACE IN VALVES

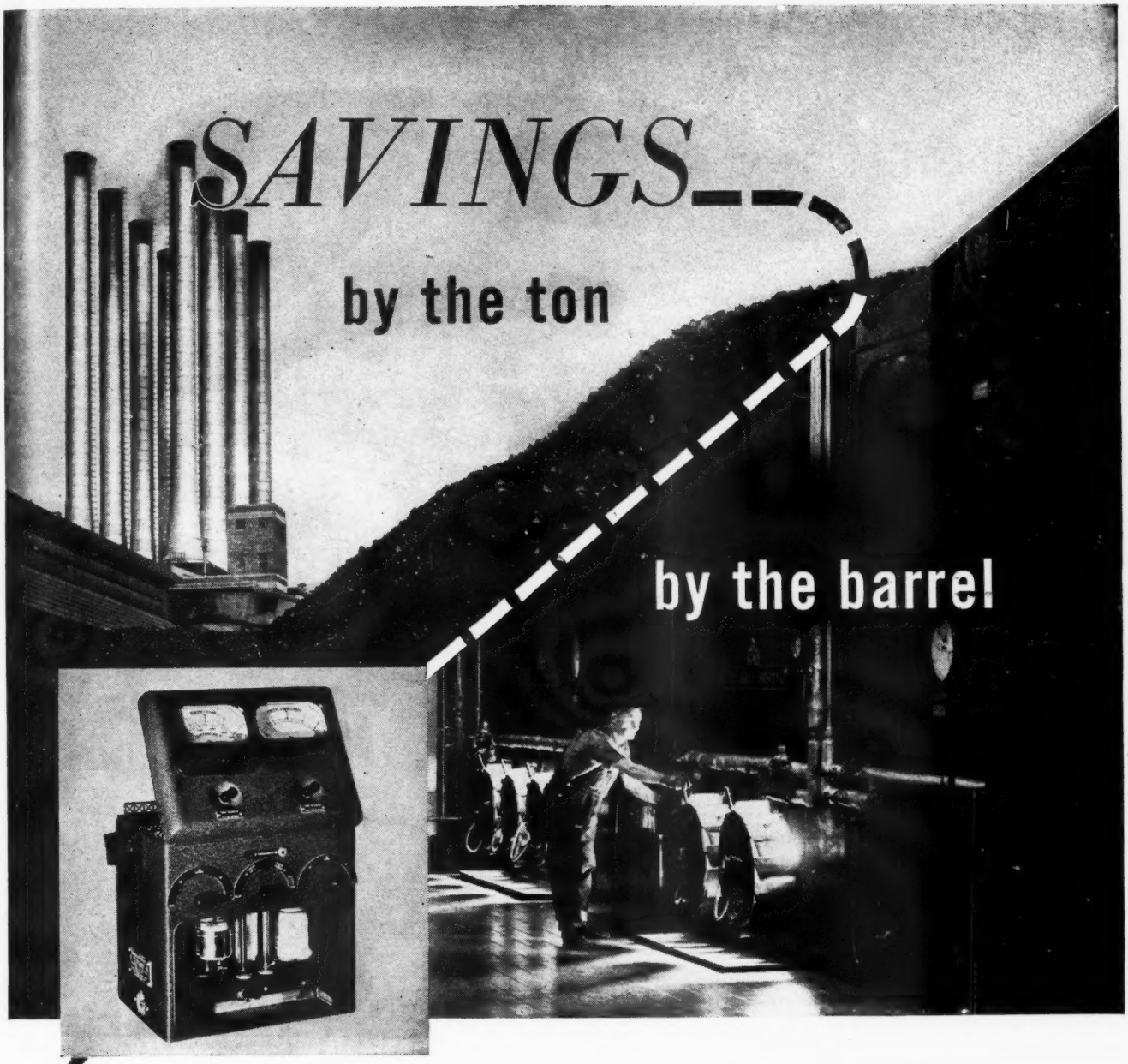
Quick and easy operation means less wear. Less wear means less maintenance! ● Take a look at the heavy I-beam wedge. Precision machined slots along each side of the wedge fit closely to the sturdy guide ribs that are integrated with the valve body, reducing vibration, assuring perfect seating. ● The rugged T-slot on top of the wedge permits a fine adjustment of the wedge to the seats, provides a positive, leakproof closure. ● The carefully machined flange, the extra body-wall thickness, the heavier construction throughout the entire design give OIC Valves the extra stamina to withstand fluctuating pressures and tough service. ● Features like these make OIC Valves operate so smooth and easy, last longer, save time, save *money!* Features like these are why OIC *Sets the Pace in Valves!*

SEND FOR THE BIG 248-PAGE CATALOG

You'll find it full of valve specifications and application data — facts that you'll want to know. Ask your distributor today, or drop a line giving us your name, address and firm. The Ohio Injector Company, Wadsworth, Ohio.

OIC VALVES

STEEL · IRON · BRONZE



The Cities Service Heat Prover Cuts Operating Costs . . . Steps up Efficiency by Scientific Control of Combustion

IN ONE QUICK EXAMINATION the Cities Service Heat Prover can tell you how much efficiency you obtain from the fuel you burn. This remarkable instrument developed in the research laboratories of Cities Service accurately measures how much fuel is wasted unburned . . . how much is wasted in uselessly heating excess air.

The instrument has been developed for use on industrial furnaces of every design regardless of the type of fuel used. It is also valuable when used for diesel and gasolene engine exhaust analysis.

There is no charge, no obligation; and no commitments made by you for this service. Write today for a demonstration.

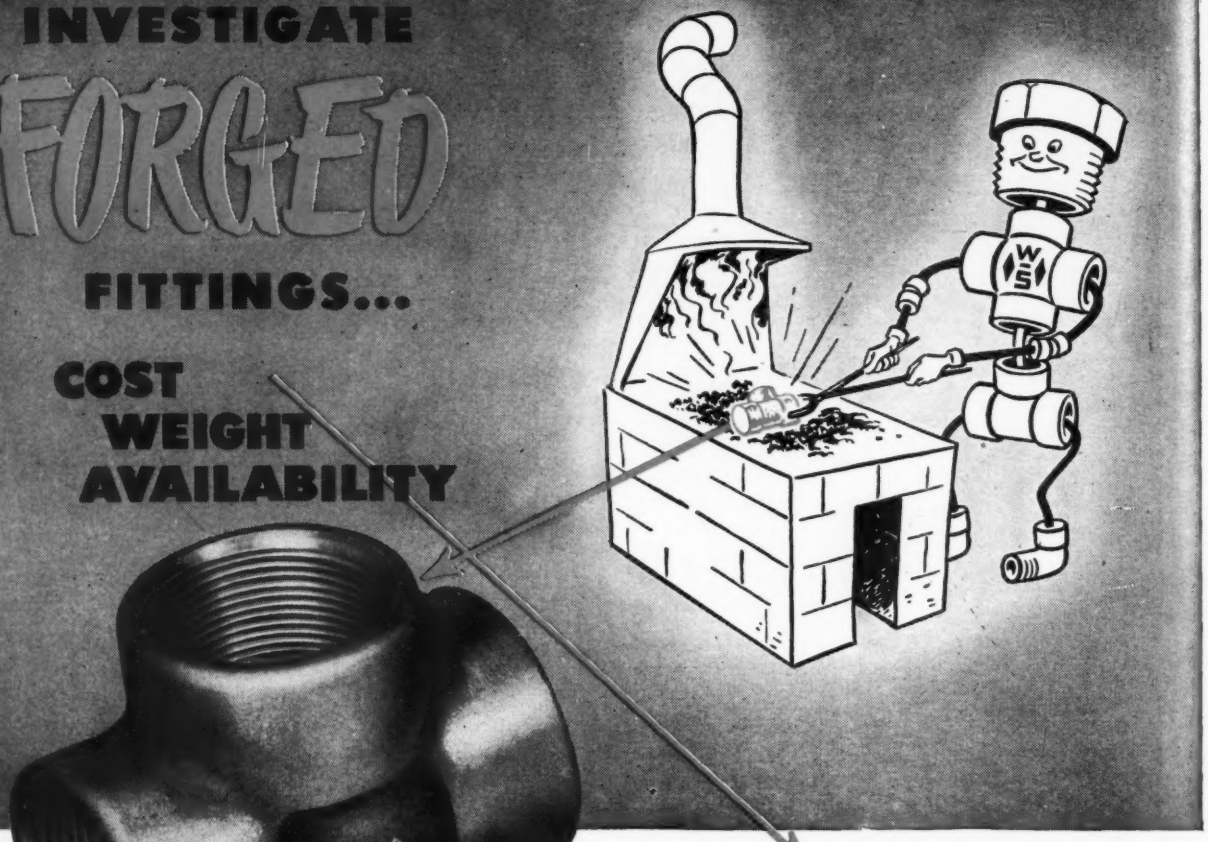
FREE—A fact-filled booklet entitled "Combustion Control for Industry." Write Cities Service Oil Company, Sixty Wall Tower, Room 234 New York 5, New York.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

INVESTIGATE FORGED FITTINGS...

COST
WEIGHT
AVAILABILITY



W-S FORGED STEEL FITTINGS FOR ALL SERVICES

Now is the time to consider W-S forged steel fittings for *all* services.

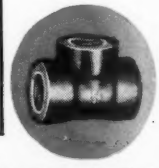
The price differential between forged fittings and cast types is less than ever before. Remember, too, that tough, accurately machined, *forged* steel fittings pay for themselves many times over in greatly reduced maintenance and down-time. Service life is phenomenal. Just put them in and forget them.

Of course, you'd expect *forged* fittings to be stronger, but did you know that, service for service and size for size, they are smaller and lighter in weight than most cast types having only a fraction of their pressure rating?

W-S distributors are located in principal cities. Consult the one nearest you about the use of stronger, lighter, cost-saving Forged Fittings for *all* services. They're available for quick delivery.

CARBON STEEL
Low Sulphur, Low Phosphor
High Tensile, High Weldability

ALLOYS
Stainless types 304—316—347
Chrome Moly—Carbon Moly—
Chrome Carbon Moly—Monel
Special alloys for Low Temperatures

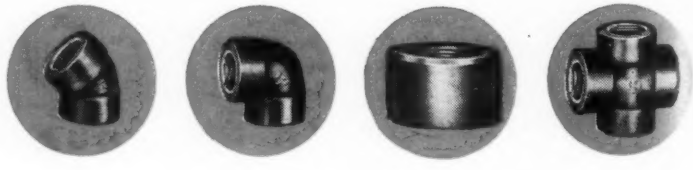


WATSON-STILLMAN

ROSELLE, NEW JERSEY

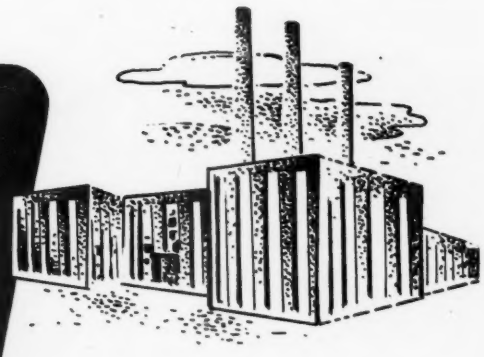
1848—CENTENNIAL—1948

SOLD THROUGH LEADING DISTRIBUTORS



4070

Bernitz Piers . . . *for Spreader Stokers last 8 times longer than Clay types!*



Like users in many plants, you'll find that Bernitz *"Carbofrax" Piers last far longer, save maintenance dollars. That's because Bernitz Piers have special features which give you three outstanding advantages:

1. *Made from* *"*Carbofrax*" — tough, heat and abrasion resisting material.
2. *Exclusive air-cooled construction* — keeps piers clinker-free.
3. *Special high-temperature resisting anchors* — firmly secure piers to furnace front.

No wonder Bernitz Piers *retain their shape throughout their long life — help make more efficient use of fuel in your stoker.*

Let a Bernitz representative show you how Bernitz Piers can cut your fuel and maintenance costs.

**"Carbofrax" is the registered trade-mark of, and indicates manufacture by, the Carborundum Company.*

BERNITZ **Piers installed in a public utility plant in Massachusetts . . . have lasted 8 times longer than clay piers formerly used that had to be renewed every three months.**

OTHER BERNITZ PRODUCTS

Bernitz Air-Cooled Furnace Lining • Bernitz Air-Cooled Floors • Bernitz-Nygaard Water Wall Blocks for Walls and Arches
Bernitz Super-Generator Linings For Water Gas Sets

BERNITZ
"CARBOFRAX PIERS"

BERNITZ FURNACE APPLIANCE CO.
89 BROAD STREET, BOSTON 10, MASS.
NEW YORK — PHILADELPHIA — SYRACUSE — ATLANTA — PITTSBURGH — CLEVELAND — CINCINNATI — DETROIT — CHICAGO — INDIANAPOLIS — MINNEAPOLIS — KANSAS CITY — RENO
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7 USES FOR LUMNITE IN POWER PLANTS

1. **Ash Pit and Cinder-Catching Linings**—Heat-Resistant LUMNITE concrete withstands wear and corrosion in both wet-type and dry-type units.
2. **Coal Bunker Linings**—LUMNITE concrete resists abrasion and corrosion.
3. **Flue and Duct Linings**—LUMNITE concrete resists abrasion of flue gases and fly ash. Provides insulation where required.
4. **For Steel Stacks**—Jointless LUMNITE linings protect steel stacks from corrosion. Their insulating properties improve efficiency.
5. **For Brick Chimneys and Linings**—LUMNITE mortar resists attack of sulphurous gases and corrosive condensate formed in intermittent and low-temperature operation.
6. **Castable Refractories, made with** LUMNITE —used for jointless walls and arches, baffles, burner blocks, door linings, stoker settings and general refractory purposes.
7. **Overnight Structural Concrete**—For rapid maintenance, LUMNITE provides full-strength concrete in 24 hours or less, even in freezing weather.

WAYS TO REDUCE OUTAGES AND CUT MAINTENANCE COSTS

Ready-to-Use

CASTABLE REFRACTORIES

Castable Refractories are factory-prepared mixtures of LUMNITE and selected aggregates. They are mixed with water on the job and cast into place for door linings, arches, baffles or furnace walls. Special shapes can be cast in molds, ready for use within 24 hours.

Castables to meet different temperature and insulation needs are made by refractory manufacturers and sold by their distributors.

Specify Castables

MADE WITH LUMNITE

Coal Bunker lined with Corrosion-Resistant Concrete. Steel or concrete bunkers, bins and silos can be protected from abrasive wear and corrosive attack with LUMNITE linings—cast-in-place, plastered or applied with a cement gun.

Write today for information on the many uses of LUMNITE in power plants.

Lumnite Division

UNIVERSAL ATLAS CEMENT COMPANY

UNITED STATES STEEL CORPORATION SUBSIDIARY

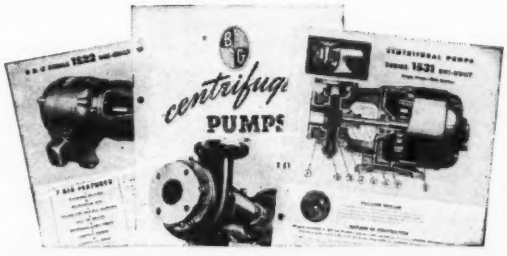
135 EAST 42nd STREET • NEW YORK 17, N. Y.

"THE THEATRE GUILD ON THE AIR"—*Sponsored by U.S. Steel—Sunday Evenings—ABC Network*

Now available with

B & G SERIES 1531
UNI-BUILT
CENTRIFUGAL PUMP

SEND FOR THESE CATALOGS ON THE COMPLETE LINE OF B & G CENTRIFUGAL PUMPS

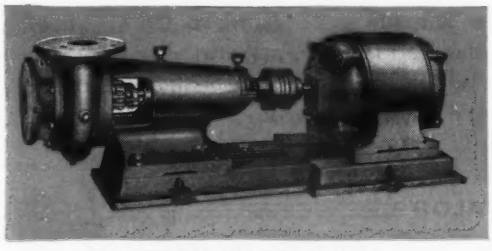


B & G Series 1531 Pumps are now offered with a new feature—a Mechanical Seal as an alternate to the conventional type of stuffing box or packing gland.

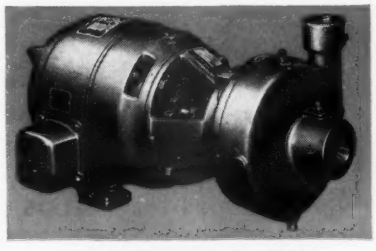
The Mechanical Seal adds materially to length of trouble-free service, especially where the pumped liquid contains foreign matter which is damaging to the ordinary stuffing box. The Mechanical Seal is *self-lubricating* and eliminates the customary leakage through the packing gland.

The unit is easily serviced. Removal of a few bolts permits separation into three parts—motor, bearing bracket sub-assembly and pump body.

All parts are machined to rigid specifications and accurately assembled. Positive uniformity throughout means quick and easy replacement in the field. High hydraulic efficiency is obtained throughout the capacity range and all pumps are shop-tested for conditions of head and capacity specified.



B & G SERIES 1510-1515 PUMPS



B & G SERIES 1522 PUMPS

Hydro-Flo* **CENTRIFUGAL PUMPS**

BELL & GOSSETT CO. • Dept. AS-36, Morton Grove, Illinois

*REG. U. S. PAT. OFF.

"Believe it or not . . . this is my COMPLETE V-Belt Inventory"

"WE used to stock 124 different sizes of endless V-belts. Now, just four reels of Veelos, the link V-belt, give us every size we need. The right length belt for any drive is uncoupled from a reel, quickly made endless, then installed. Machine downtime for belt changeover is almost eliminated by the ease with which matched sets of any required length can be coupled on a drive. And by switching to Veelos, we've made a big saving on our V-belt investment."

You can do the same.

4 reels of Veelos provide as many as 316 sizes of endless V-Belts

Very likely you need less than 316 sizes for a complete V-belt inventory. When you stock Veelos on reels you can forget belt deterioration and obsolescence. Storage space is saved. Inventory records are simplified.

Veelos is made in all standard sizes . . . fits all standard grooves . . . is available in 100 foot reels. Sales engineers in principal cities; over 300 distributors throughout the country.

VEELOS
THE LINK
V-BELT

NEW VEELOS CATALOG

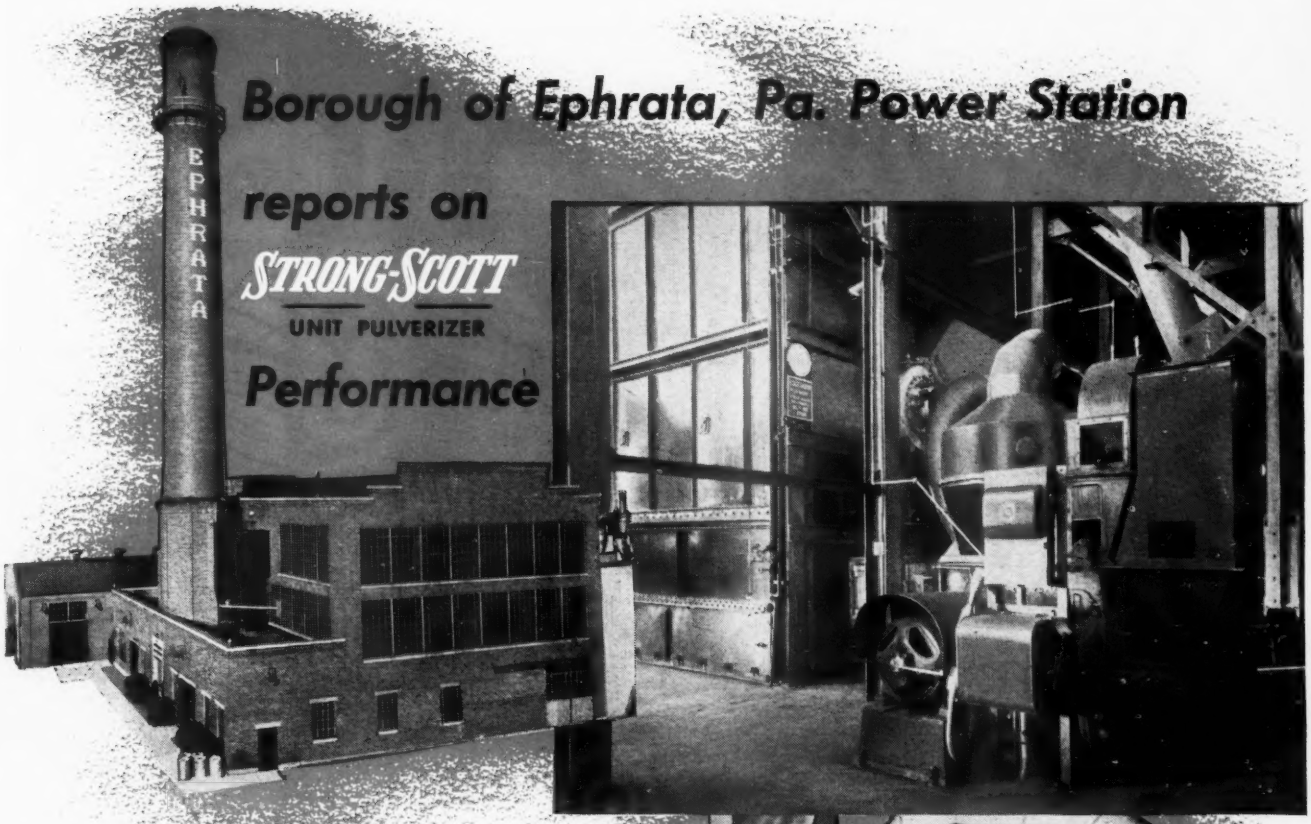
This is the catalog that brings many V-belt benefits to you. It gives you all the facts and complete engineering data. Your copy sent on request.

MANHEIM MANUFACTURING & BELTING COMPANY
MANHEIM, PENNSYLVANIA

VEELOS is known as VEELINK outside of the United States

ADJUSTABLE TO ANY LENGTH • ADAPTABLE TO ANY DRIVE

Borough of Ephrata, Pa. Power Station reports on STRONG-SCOTT UNIT PULVERIZER Performance



★ **Meets Fluctuating Load Demands**

★ **Uniform Feed . . . Any Bituminous Coal**

★ **Easy Low Cost Maintenance**

Ephrata's STRONG-SCOTT Unit Pulverizer has given complete satisfaction since it was installed in 1941.

The Ephrata power generating steam plant carries an average daily load of 30,000 lbs., which fluctuates between 16,000 lbs. and 42,000 lbs. It uses bituminous coal ranging in volatile from 23 to 30.

These changing load demands and the fuel quality variations have been handled with utmost efficiency by the STRONG-SCOTT Unit Pulverizer's automatic underfeeding of fuel and flexible fuel-air mixture controls.

Fan blade changes have been necessary only after an average of 30 months of use. Rotor blade changes take 6 man hours every three to four weeks.

STRONG-SCOTT'S long list of satisfied users includes the Ephrata power station and many others in the municipal power-plant field. Visit one of these in your vicinity and see a STRONG-SCOTT Unit Pulverizer in action!

Write today for bulletin 341 for complete information. Names of users furnished on request.

Cutaway view shows simple, rugged design of Strong-Scott Unit Pulverizer. Flow of pre-heated air shown by arrows eliminates wet or frozen coal problems.

The STRONG-SCOTT Mfg. Co.

455 TAFT STREET N. E. • MINNEAPOLIS 13, MINN., U. S. A.

STRONG-SCOTT UNIT PULVERIZER

Chlorination...

REDUCES CONDENSER "DOWN-TIME"

When high back-pressure due to slime fouling on condenser water-side surfaces results in excessive down-time and costly plug cleaning, the best "doctor" is chlorination. Here's why:

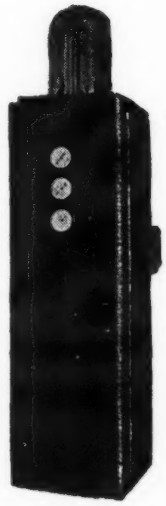
Properly applied chlorination by means of a job-engineered W&T installation is economical. In most cases, the cost of the equipment is saved in the first year.

Chlorination gets at the source of the trouble by killing the micro-organisms that cause slime deposits.

Plug cleaning is eliminated and equipment may be kept on the line thus, in effect increasing station capacity.

Fuel costs are reduced through reduction in average back-pressure.

W&T's more than thirty years' experience in water treatment are always at your call. Write today for a survey of your cooling water system—there's no obligation.



WALLACE & TIERNAN
PRODUCTS, INC.
CHLORINE AND CHEMICAL CONTROL EQUIPMENT
Belleville 9, New Jersey • Represented in Principal Cities

CD-29

Metallurgical Research conducted continually by recognized specialists who have made major contributions in this field.

Unique Technical Backing of an extensive organization with an international reputation in both process and fabrication engineering.

Complete Facilities for the fabrication of steel products from simple forgings to the most intricate 120 foot towers.

Quality Control embracing the constant application of the most advanced inspection methods, both visual and non-destructive.

On-Time Delivery made possible by a flexible planning group authorized to re-route work to meet promised dates.

Top Welding Performance assured by specially designed equipment and exclusive employment of master operators.

Up-to-the-minute . . . because 30 years are behind it

300,000 KW of new electrical power capacity depend on this and companion pieces of piping—destined to connect the throttles and steam chests of three new turbines in a large metropolitan powerhouse. They are made of 18-8 alloy steel—.718" thick, 6⅝" outside diameter, to operate at 1730 psig at 1050°F. There just can't be any defects, any locked-up stresses, any faulty metal formations, or deviations from contour, no matter how minor—not in piping as important as *this*.

Kellogg started preparing for this order more than thirty years ago . . . when a turbine was a textbook subject and 18-8 was just out of the laboratory. It was then that Kellogg started to amass alloy performance data . . . started to investigate methods of welding and heat treatment . . . established the nucleus of the present Kellogg Metallurgical Laboratory and Quality Control System.

The data, the amassed knowledge, the fabricating experience of thirty years are as apparent in the perfection of these vital power connections for industry as they are in the pioneering work which Kellogg metallurgists are now undertaking in the newer and more dramatic fields of gas turbine, rocket and ram jet propulsion devices.

When you place orders today with Kellogg for critical power piping you know that each piece of piping delivered, bearing the Kellogg stamp, will have this same thirty years of preparation behind it.

FABRICATED PRODUCTS DIVISION

THE M. W. KELLOGG COMPANY

A SUBSIDIARY OF PULLMAN INC.

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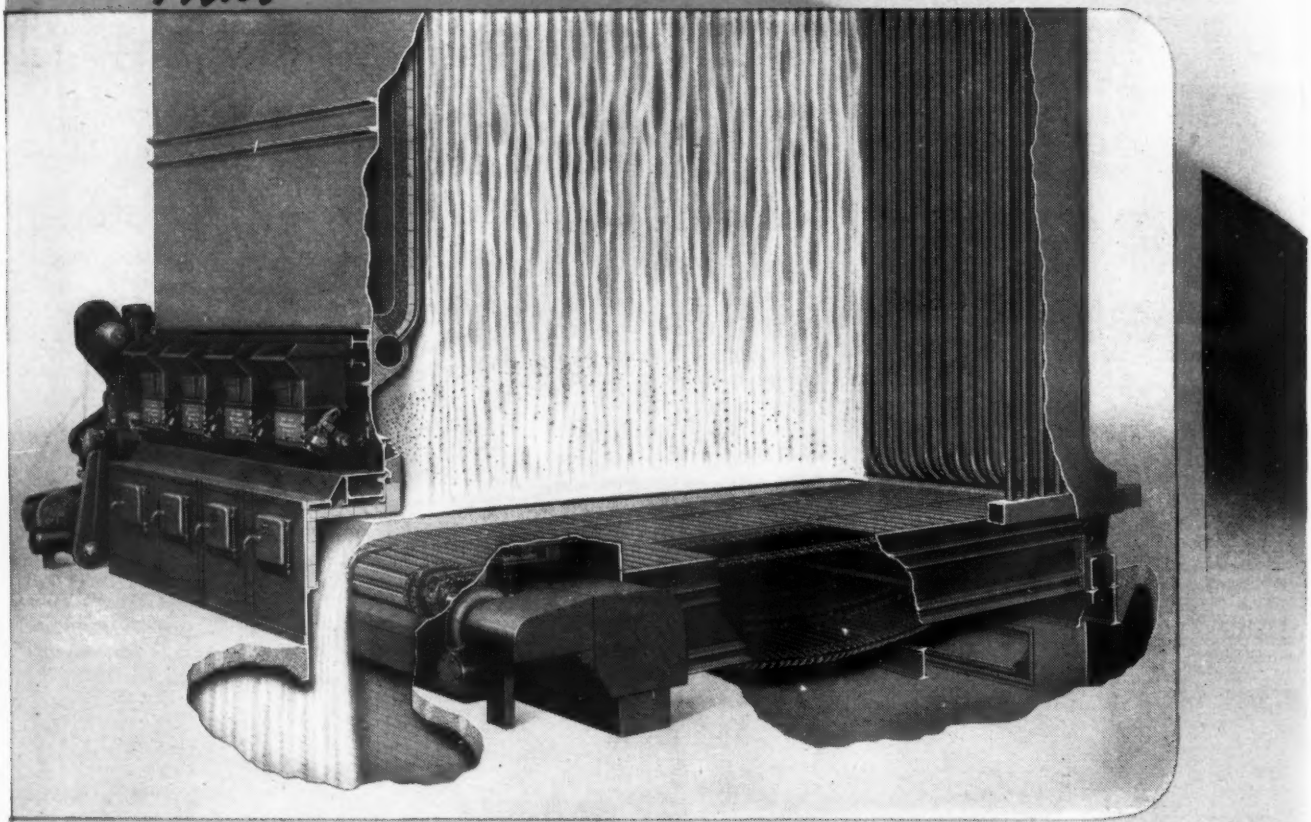
KELLOGG

VESSELS • EXCHANGERS • CONDENSERS • HIGH PRESSURE AND HIGH TEMPERATURE POWER PIPING
PROCESS PIPING • FORGED AND WELDED FITTINGS . . . IN ALL STEELS, ALLOYS OR SPECIAL COMBINATIONS

...Ask any User about DETROIT ROTOGRATE STOKERS That REVOLUTIONIZED COAL BURNING



RotoGrate Stoker with six grate sections as applied to a typical water cooled furnace of a steam generator. Two of the six Rotors are removed to show the overlapping grate design.

Some of these plants installed Detroit RotoGrate Stokers ten years ago. They have all used them for several years.

They can tell you:

1. RotoGrate is reliable — high availability.
2. Combustible loss in ash pit extremely low.
3. Burns any bituminous steam coal or lignite.
4. Burning rates higher — flexibility greater.
5. No clinker difficulties.
6. Little power to operate.

Investigate the RotoGrate — the *original* spreader stoker with *forward* moving grates that slowly and continuously discharge the ash at the *front*. Operation is fully automatic.

TYPICAL USERS OF DETROIT ROTOGRATE *Stokers*

Rath Packing Co.
Central Illinois Electric & Gas Co.
Pontiac State Hospital
J. I. Case Co.
Studebaker Corporation
Falk Corporation
Northwest Paper Co.
Wyandotte Municipal Plant
General Motors Corporation
American Box Board Co.
Consolidated Paper Co.
Sioux City Gas and Electric
Chrysler Corporation
Goodyear—St. Mary's Division
Motor Wheel Corporation
American Steel Foundries
Wyman Gordon Co.
American Distilling Co.
State University of Iowa
Northern States Power Co.
Great Western Sugar Company
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National Forge and Ordnance Co.
Muscatine Municipal Plant
Chesapeake & Ohio Railway Co.
Ohio Rubber Co.
Borden Co.
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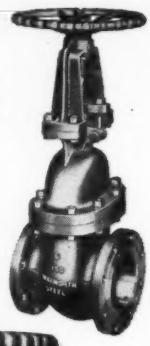
DETROIT ROTOGRATE STOKER

DETROIT STOKER COMPANY

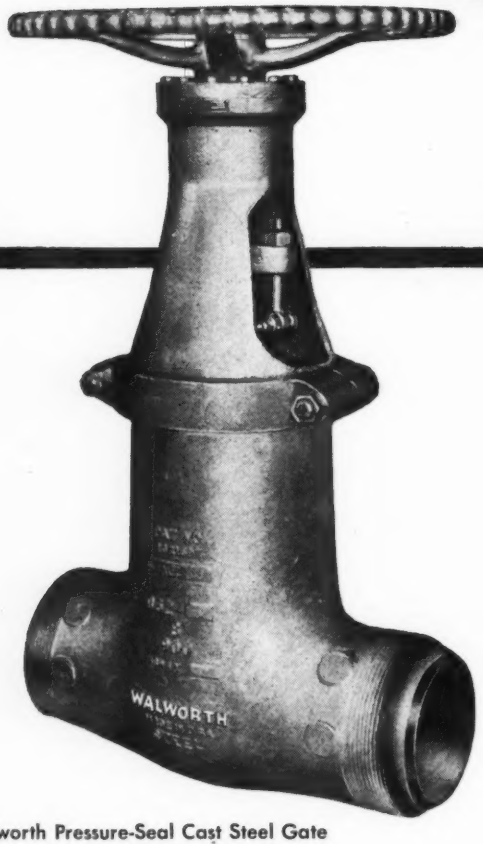
GENERAL MOTORS BUILDING, DETROIT 2, MICHIGAN

WORKS AT MONROE, MICHIGAN • DISTRICT OFFICES IN PRINCIPAL CITIES

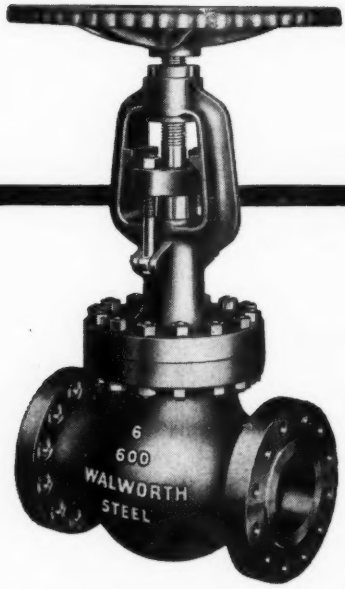


Walworth Series 150 Cast Steel Valves are tough and wear-resistant. Gate valves are available in sizes from 2" to 24", and globe valves in sizes 2" to 12".

Years of trouble-free service assured with . . .



Walworth Pressure-Seal Cast Steel Gate Valves exemplify the greatest improvement in high-pressure, high-temperature valve design. The internal pressure keeps the body-to-bonnet joint tight. Series 600: 1½" and larger — Series 900: 3" and larger — Series 1500: 1" and larger.



Walworth Series 600 Cast Steel Valves have strength and ability to resist wear. They assure long life and positive operation. Available in either gate or globe types — Gate: sizes 1½" to 18" — Globe: sizes 2" - 8".

WALWORTH cast steel valves

Walworth Cast Steel Valves have proved their ability to assure years of trouble-free, dependable service. Accurately threaded stems, deep stuffing boxes, streamlined ports, and heavy cast alloy steel walls are their top features.

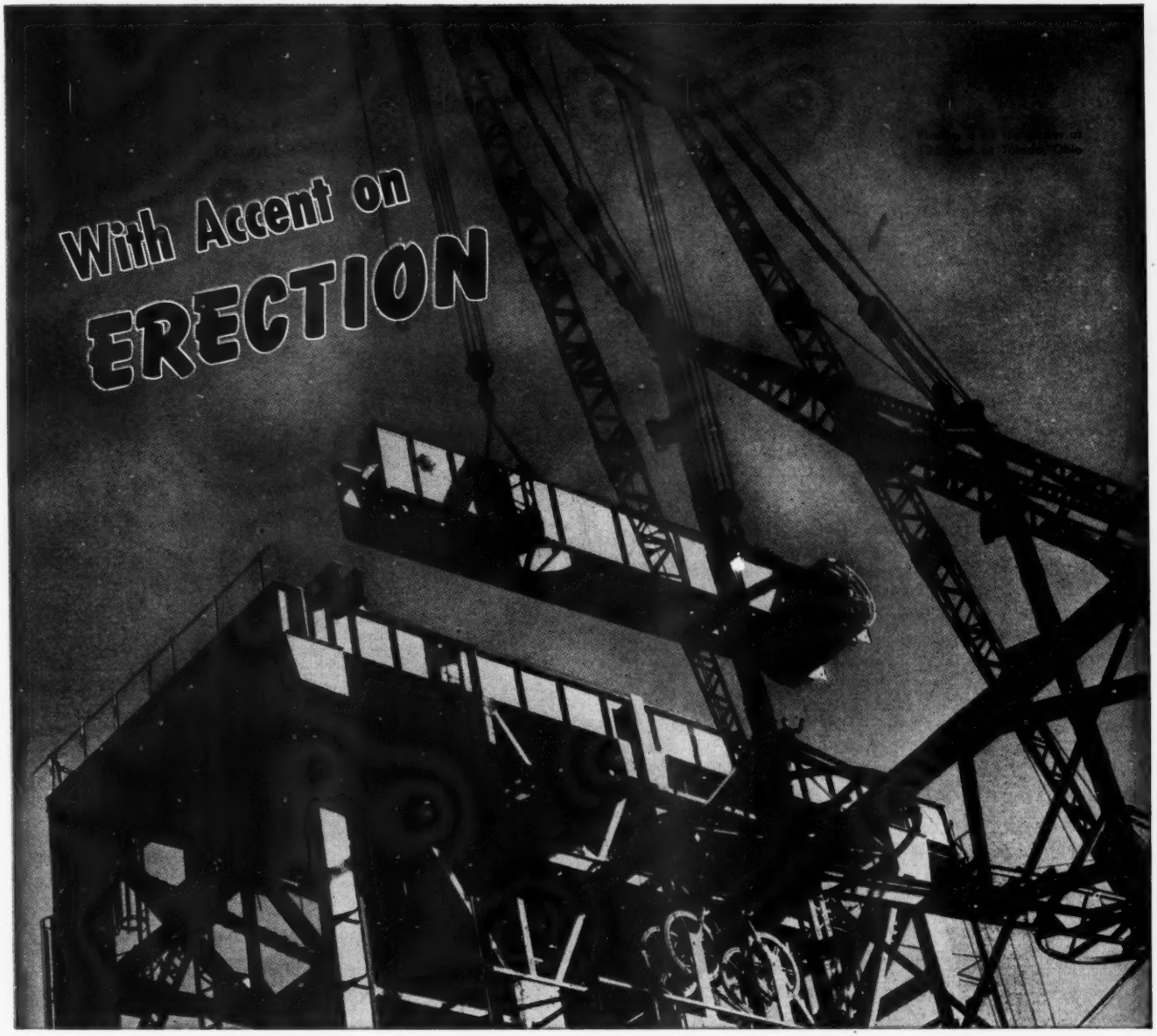
You can get full information about Walworth's complete line of steel, iron, and bronze valves and fittings from our new Catalog 47. See your nearest Walworth distributor, or write on business stationery for your free copy.

Walworth Cast Steel Fittings are manufactured in a wide range of types and sizes to meet every requirement. They are made to the highest standards of quality, both as to dimensional accuracy and metallurgical properties.

WALWORTH
valves and fittings

60 EAST 42nd STREET, NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD



"All The Way from Design to Erection" is far more than a slogan with Heyl & Patterson. It is a plan of operation wherein each essential function from design to successful operation is performed by the one organization.

The many years of successful application of this plan of operation has developed a spirit of teamwork on the part of the Heyl & Patterson design, electrical, fabrication, machine shop and erection departments.

This teamwork permits the successful execution of our contracts for Heavy Bulk Materials Handling Equipment on time and on a basis that brings years of satisfaction to our customers.

What makes them TICK?

H&P field specialists have become acquainted through the years with the manner in which every other part of the team operates. Because of this knowledge they can do a better erection job for you.

Ore Bridges
Railroad Car Dumpers
High Lift-Turnover-Rotary
Coal & Coke Handling Equipment
Boat Loaders & Unloaders
Pig Iron Casting Machines
Rotary Mine Car Dumpers
Coal Crushers
Coal Storage Bridges
Car Hauls & Boat Movers
Bradford Breakers
Refuse Disposal Cars
Thorsten Coal Samplers

Heyl & Patterson, Inc.

"SINCE 1887"

55 WATER STREET · PITTSBURGH 22, PA.

(Advertisement)

Arc Welding Simplifies New Power Plant Installation

By William P. Miller, Secretary
Smith & Oby Co., Heating Contractors
Cleveland, Ohio

THE new power plant installation now under construction for the Perfection Stove Company, Cleveland, Ohio, provides for three boilers of 600 horsepower each, delivering steam pressure at 125 lbs. per sq. in. for heating and processing requirements. Many complex piping problems with space restrictions are being solved daily through the use of fast, low-cost arc welded pipe construction.

All piping from 3″ to 12″ is being arc welded (Fig. 1). Total weld penetration for pressure-tight joints is obtained by chamfering the pipe and fittings before butt welding with three passes of "Fleetweld 5" electrode, using Lincoln "Shield-Arc" welders. Carrier supports for the pipe lines are made from 6″ and 8″ channels welded as shown also in Fig. 1. These simple, inexpensive pipe brackets allow the pipe to be strung close to the wall on roll carriers that are bolted to the support arms.

Take-off connections are easily made at any desired location. A hole is first flame-cut in the line and the take-off pipe then welded as shown in Fig. 2. The hole is made ⅛″ larger than the take-off pipe to provide 100% penetration.

Header construction is made more compact by the use of short tube bends and prefabricated reducers. Larger size reducers (Fig. 3), not readily available as prefabricated units, are shop built by flame-cutting triangular sections from pipe, forming the reducer to shape by hammering and then butt welding the seams.

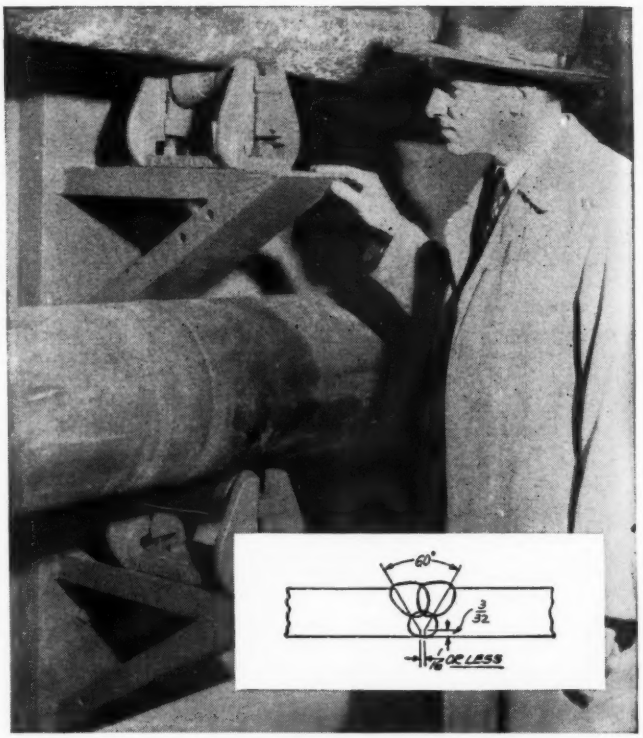


Fig. 1. All-welded 12″ and 8″ transmission pipe lines mounted on welded roll carrier supports.

The many small pipe carriers needed for this installation are inexpensively made with welding. Steel straps ¼″ x 2″, bent to a "U", have small round pins welded on to hold the pipe as shown in Fig. 4. The assembly is then fillet welded to a 3″ x 3″ carrier angle support. Thermostat control tubing is carried in a trough consisting of a 1″ x 1″ angle welded to the strap.

Fig. 2. Arc welding a take-off connection to main 12″ pipe line.

Fig. 3. Steam header unit showing weld-fabricated reducer.

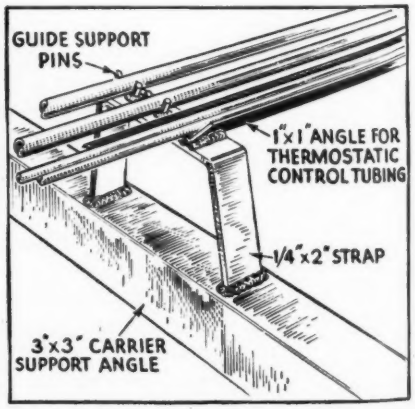


Fig. 4. Pipe carrier support for small pipe lines and thermostat controls.

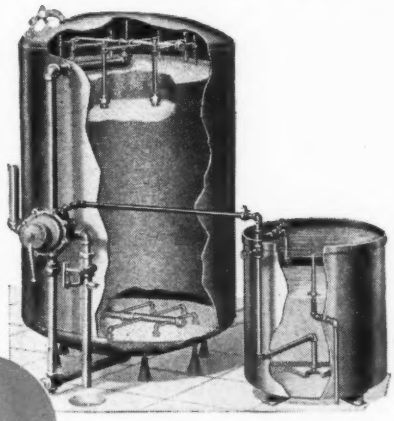
The above is published by LINCOLN ELECTRIC in the interests of progress. Properties and procedures of "Fleetweld 5" electrode are given in Bul. 403. Write The Lincoln Electric Company, Dept. 253, Cleveland 1, Ohio.

TWO WAYS

to cut water softener costs

In thousands of installations the Elgin "Double-Check" principle has proved the most revolutionary development in Zeolite water softeners in recent years. The operating records of these installations show that the "Double-Check" softener delivers up to 44% more soft water, size for size, than any other—costs less to buy and operate.

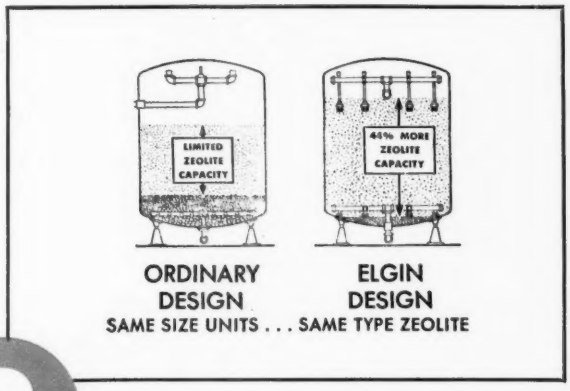
Note that there are two ways you can cut water softener costs with the "Double-Check" principle as pointed out here:—



1 ***By installing a new Elgin "Double-Check" Softener***

The accompanying diagrams show why the Elgin "Double-Check" Softener gives up to 44% more soft water per regeneration than others. Note that a softener of conventional design is compelled to use far less zeolite than an Elgin of equal size because it has no means of preventing the escape of zeolite during backwashing.

In the Elgin Softener, the "Double-Check" manifold arrangement prevents loss of zeolite even at a far higher backwash rate. The deeper zeolite bed that can be carried, means more water softening capacity, and the higher backwash rate means better opening up of the bed, more thorough regeneration by the brine, *more efficient utilization of more zeolite!* (This means that a smaller Elgin does the work of other larger softeners.)



2 ***By having the "Double-Check" Method applied to your present softener***

The dollar-saving advantages and extra capacity of the Elgin "Double-Check" manifold system can be fully realized by having it applied to any existing water softener. Indeed there could be no better proof of the merit of the "Double-Check" principle than the fact that operating men have had it applied to hundreds of softeners of every make.

Our district engineer will be glad to show you how your present softener of any make can be modernized (without having to buy a new unit) by installing upper and lower "Double-Check" manifolds as illustrated here with Elgin high capacity zeolites to suit your conditions. The net result will be a remarkable increase in soft water at far lower cost per gallon. (With the newer Elgin high capacity zeolites, you can get 3 to 10 times as much soft water per regeneration.)

ELGIN SOFTENER CORPORATION

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Representatives in principal cities

ELGIN ECONOMICAL WATER CONDITIONING

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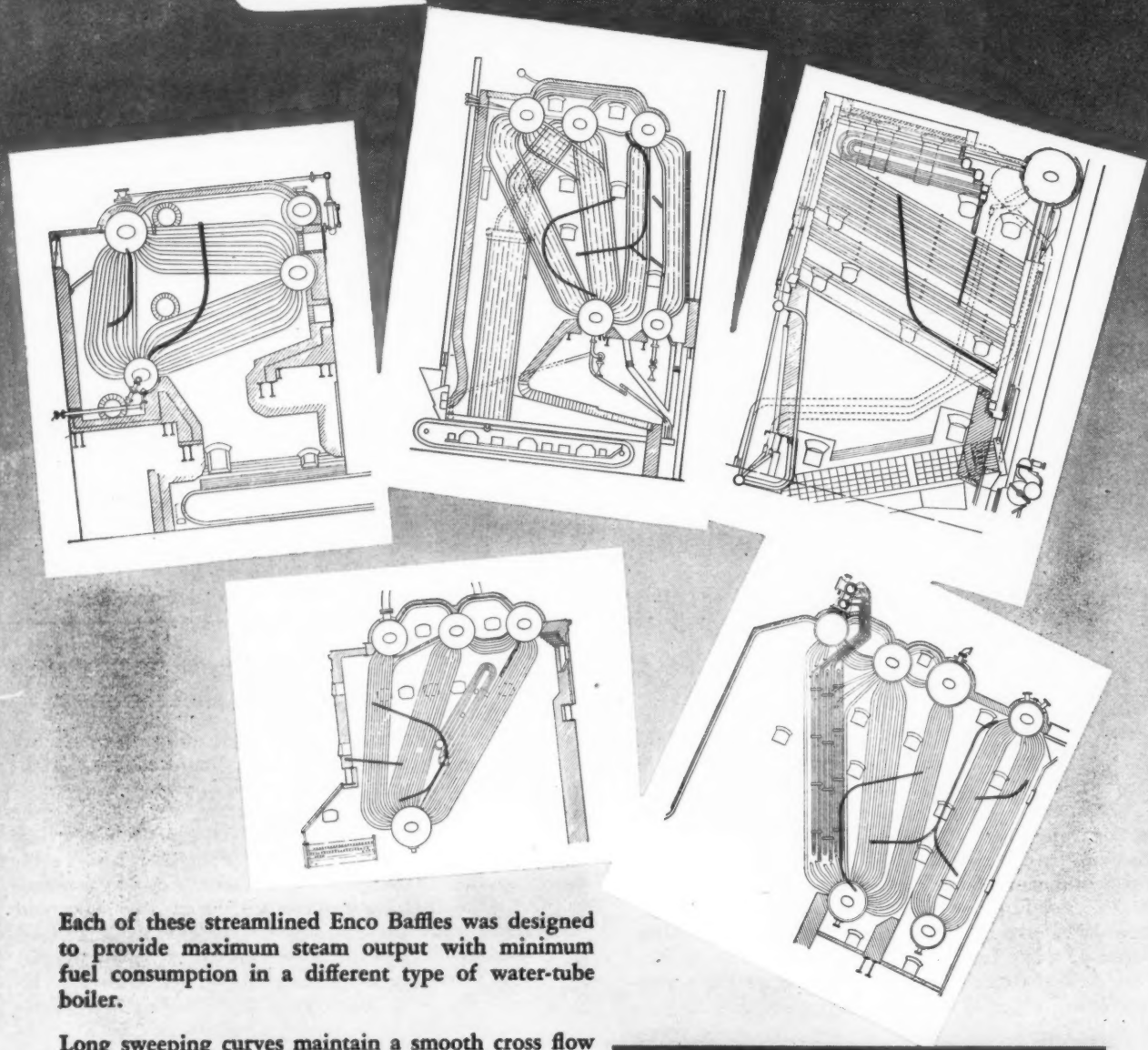
Every engineer knows that no single piece of equipment—no one method—offers a solution to *all* water conditioning needs.

Since Elgin offers *all* authoritative methods—softeners, post treatments, boiler feed water treatments, corrosion prevention, filtration, taste and odor correction—we are bound by no method except the *one best method.*

An analysis of your problem by your nearby Elgin engineer will show you that the Elgin way is the low cost way—the undivided-responsibility way.

Streamlined for Savings
IN EVERY TYPE OF BOILER



Each of these streamlined Enco Baffles was designed to provide maximum steam output with minimum fuel consumption in a different type of water-tube boiler.

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Enco Streamline Baffles are individually designed and engineered to the exact requirements of your boiler. Experienced Enco-trained crews take charge of the installation.

The 18-page Enco Bulletin, BW44, shows how engineers throughout industry have gotten higher boiler efficiency and increased steam production through the use of Enco Streamline Baffles. Why not write for your FREE copy today?

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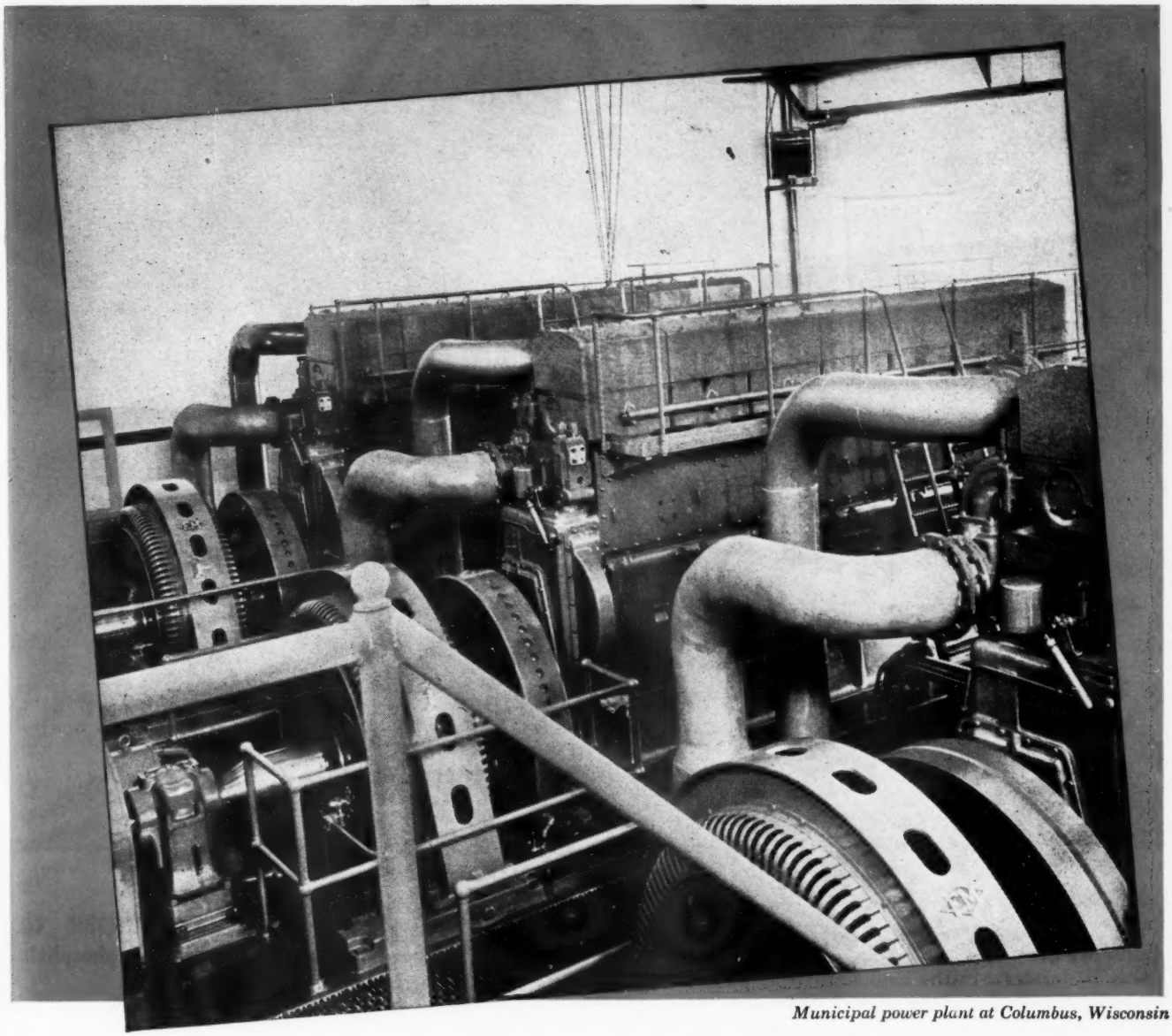

Municipal power plant at Columbus, Wisconsin

Case of the smart City Fathers

THE city fathers at Columbus, Wisconsin, have reason for pride in their municipal power plant, with its modern Worthington diesels and streamlined piping. Exhaust cooling and lube lines were put together with Tube-Turn welding fittings. They permitted high-speed installation and assure top piping efficiency with low upkeep.

Tube-Turn welding fittings fit flush with the pipe. Insulation is simplified. Smooth changes in flow direction reduce pressure loss and erosion. The welded connections are strong as the pipe, permanently leakproof, safe. No shutdowns.

Tube-Turn welding fittings carry the No. 1 trade name in the field. They are dependable for strength, dimensional accuracy, and adherence to standards. They come in a wide range of types and sizes, metals and alloys. Your nearby Tube Turns distributor carries a large stock. For good service in good connections, specify "Tube-Turn."

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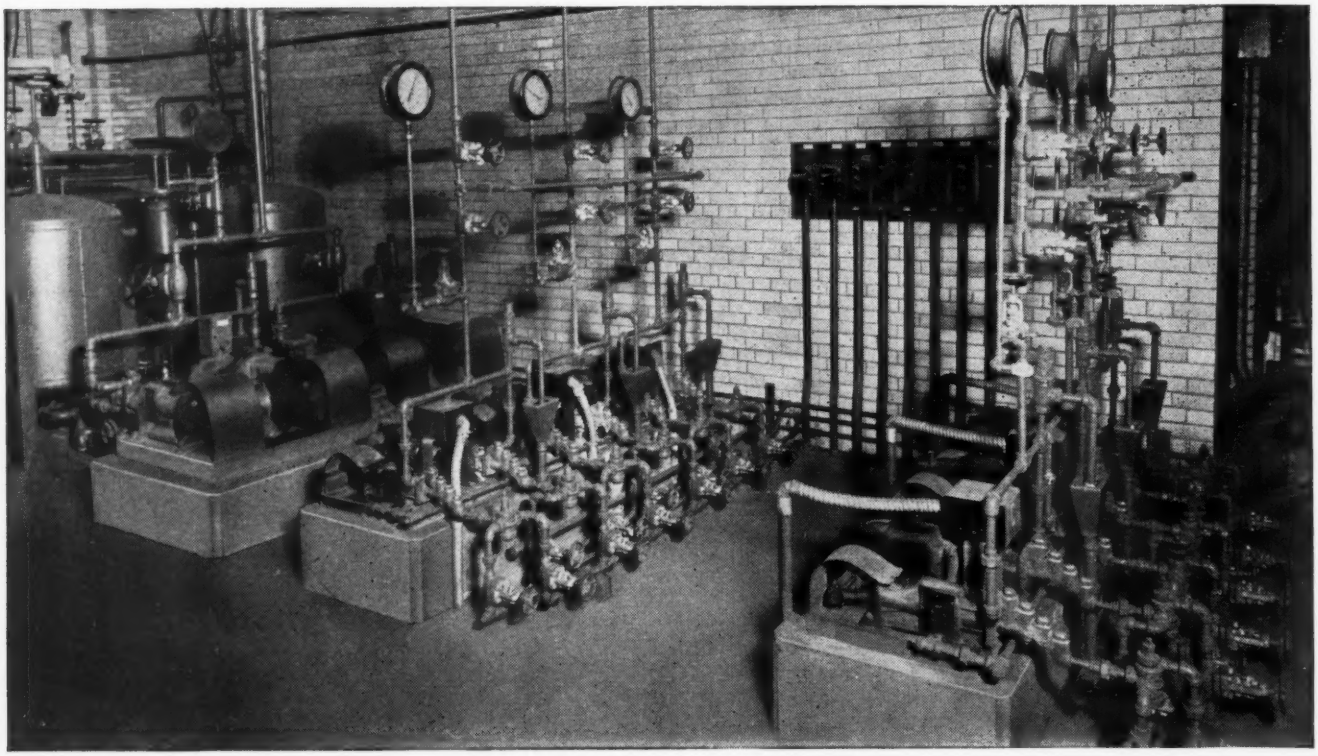
WELDING FITTINGS AND FLANGES

Write for folder of quick reference tables, "Dimensional Data and Weights of Tube-Turn Welding Fittings."



FOR BOILER WATER CHEMICAL TREATMENTS

Specify • Milton Roy Chemical Pumps • Milton Roy Chemical Feed Systems

Proof of "Performance" in chemically treating boiler water are the many installations of Milton Roy equipment in modern utility and industrial power plants . . . both complete Milton Roy "Packaged" Systems engineered for specific applications and Chemical Pumps as components in systems developed by plant engineers. In the plants listed below typical installations of such equipment have been made in recent months.

SPRINGS COTTON MILLS, GRACE, S. C. (Complete packaged systems, including tanks and accessories, for handling both sulfite and phosphate feeds.)

ESSEX (NEWARK) GENERATING STATION, PUBLIC SERVICE ELECTRIC & GAS CO. (Pumps.)

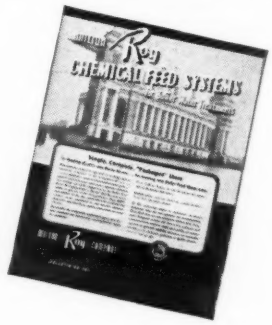
LANSING (MICH.) STATION, INTERSTATE POWER CO. (Pumps and tanks for feeding sulfite and phosphate.)

EAGLE POINT WORKS, TEXAS CO., WESTVILLE, N.J. (Pumps.)

MANSFIELD TIRE & RUBBER CO., MANSFIELD, OHIO (Pumps.)

SOUTHWARK STATION, PHILADELPHIA ELECTRIC CO. (Packaged systems, for feeding sulfite and phosphate. Shown above.)

Milton Roy Packaged Systems include all necessary pumps, solution tanks, covers, gage glasses, low level cutouts, alarms and motor starters. They can be supplied with automatic electronic controls to operate pumps at speeds proportional to feed water flow as measured by a flow meter. Available to handle all treating chemicals and in capacities to meet all pressure and capacity requirements.



Details in Bulletin 451 . . . ask also for Technical Paper 51 "What the Power Engineer Needs to Know About Chemical Feed Systems."

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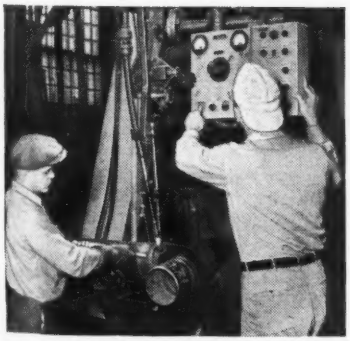
PREFABRICATED PIPING IS IMPROVED

Closeup of the weld being laid. Note smoothness of the overlapping beads.

Movable bridge transports welding head and equipment over the various work rotating machines. Operator is shown adjusting flow of flux that submerges the arc; helper cleans weld with chipping hammer as it rotates past him.

by MIDWEST MACHINE WELDING

WITH SUBMERGED ARC



Operator stops machine at completion of weld by simply pressing button. Push button controls position welding head exactly over work clamped in rotating machine.

Better welding is assured by this Midwest development because the "human element" has been eliminated for all practical purposes. Aside from work positioning, the operator simply starts and stops the machine; his helper chips off the slag . . . all else is automatic.

Quality of the weld is improved because the machine follows the predetermined procedure *exactly . . . everytime*. The puddle is larger and the arc is better shielded and controlled. The possibility of locking up slag is minimized while undercutting is practically impossible. The greater number of beads is a further improvement.

This application equipment, developed and built by Midwest for use in its own fabricating plants, is representative of the modern facilities used by Midwest to assure better piping.

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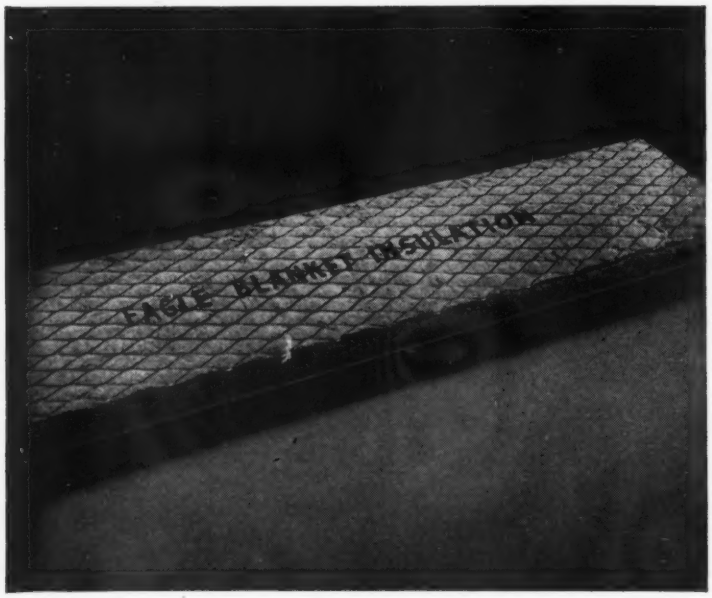

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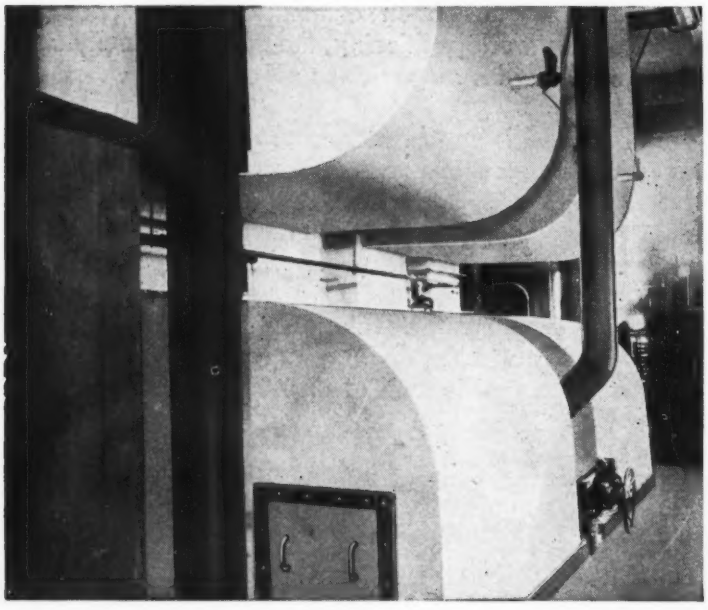

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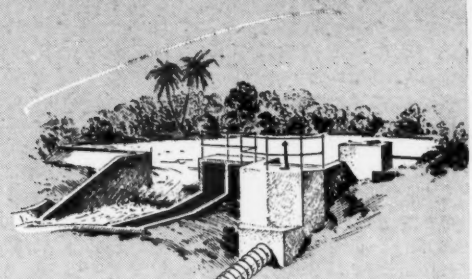
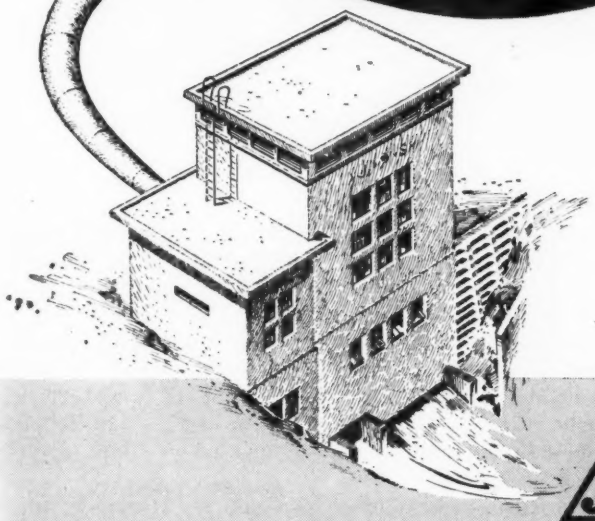


Water is diverted from the source of Roaring River through 6,800 feet of pipe line to a single unit turbo-generator plant where a 520 foot head is converted into 4,500 kva of electric energy. Stone & Webster Engineering Corporation designed the plant and supervised its construction.



The Hydroelectric Development on Roaring River in Jamaica, B. W. I. was designed and constructed for Jamaica Public Service Company, Ltd. to supplement their White River and Bog Walk Hydroelectric Plants. These hydro-power plants make the island largely independent of outside resources in its production of power, relieving the oil burning power plant in Kingston of a large part of its load.

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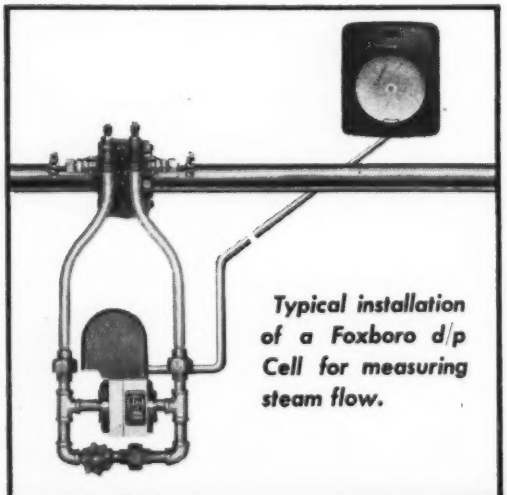

Typical installation of a Foxboro d/p Cell for measuring steam flow.

The new Foxboro d/p Cell is a flexible, easily-calibrated device operating on the highly accurate force-balance principle. *No mercury is used.* It transmits flow measurement to remote, conveniently-located pneumatic receiving instruments (indicating, recording, or controlling). It is small, weighs less than 20 lbs. . . .simple in construction. Absolute built-in overrange protection on both sides.

NO CONDENSING CHAMBERS NEEDED

Essentially zero displacement of the measuring element eliminates the need for condensing chambers. Because of its compact size, the d/p Cell can be installed close to the steam line . . . and the entire installation insulated where there is danger of lead line condensate freezing.

Learn all about this new, unique development. It may be the ideal solution to your measurement problem. Write for Bulletin 420. **The Foxboro Company, 68 Neponset Ave., Foxboro, Mass., U. S. A.**

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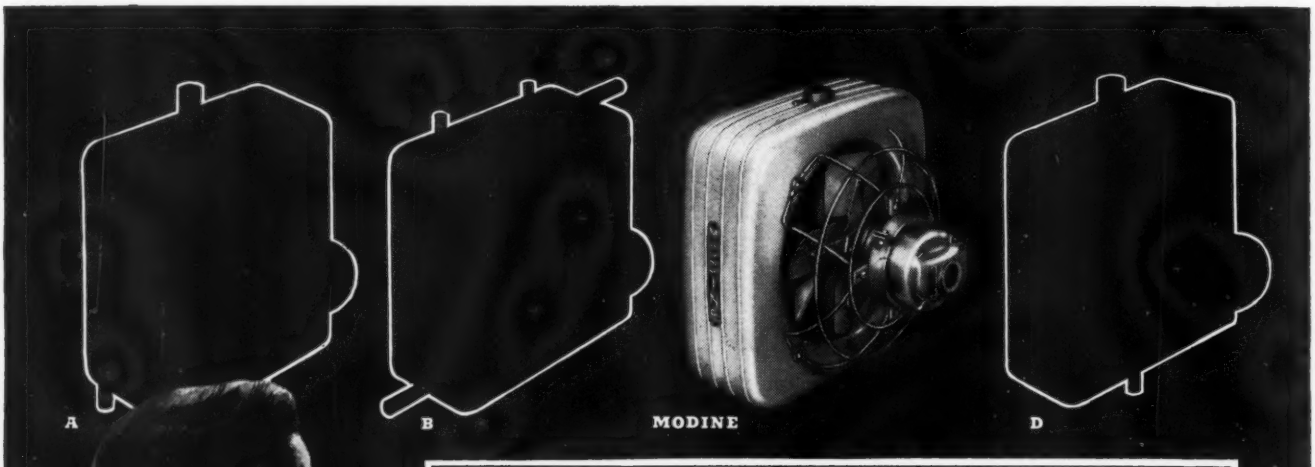

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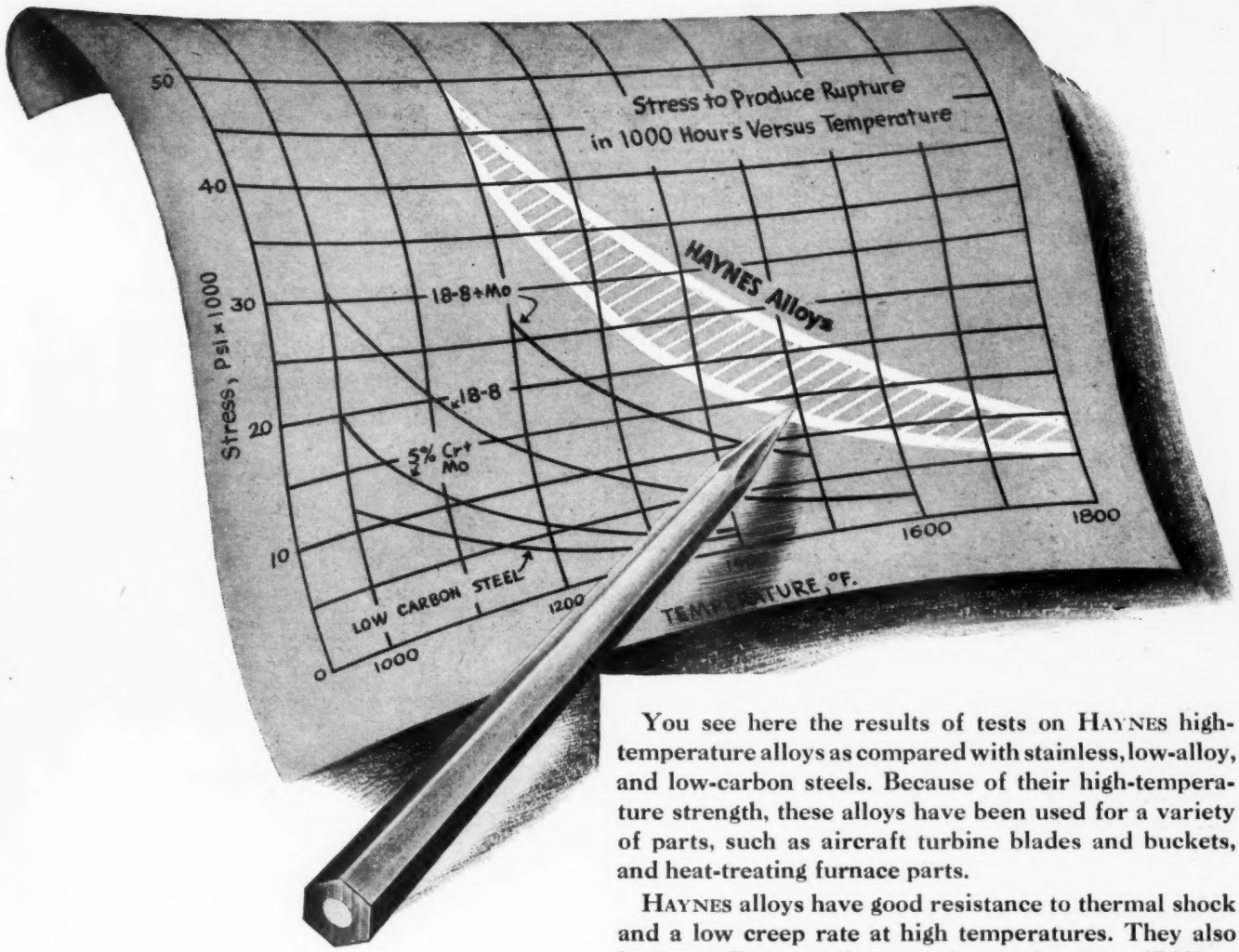
Modine Unit Heaters



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HAYNES alloys have good resistance to thermal shock and a low creep rate at high temperatures. They also have excellent tensile strength—ranging from 45,000 to 70,000 psi at 1500 deg. F. And this strength is maintained and enhanced through the aging characteristics that occur in the range of 1300 to 2000 deg. F. The alloys are also resistant to oxidizing and reducing atmospheres at these temperatures.

You can obtain HAYNES high-temperature alloys—sold under the trade-marks HAYNES STELLITE, HASTELLOY, and MULTIMET—in the form of precision castings, or as sand castings, bar stock, sheet, welding rod, and cast coated electrodes.

Write to any District Office for further information on these high-temperature alloys. Or, for on-the-job help, ask to have a representative call.

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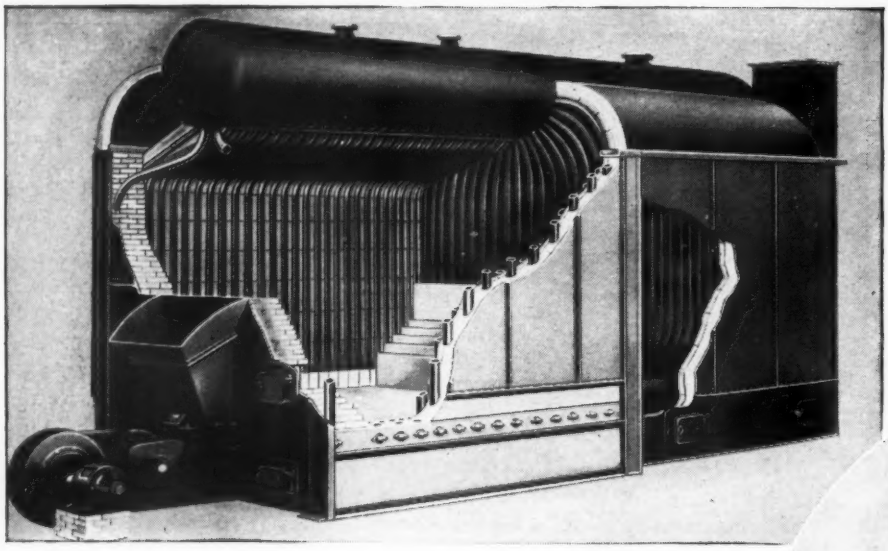
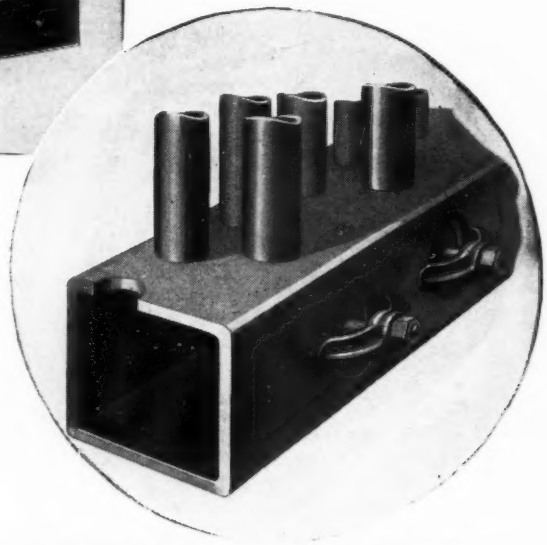
TYPE-VL *A Low Headroom*
2-DRUM WATER WALL BOILER



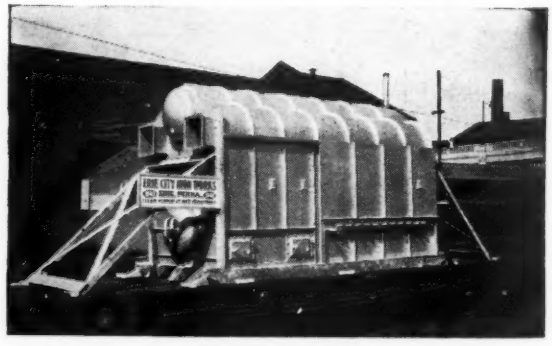
SHIPPED BUILT-UP IN SIZES TO 300 H. P.



Water Wall tube arrangement—1 Downcomer for each 2 Riser Tubes

Clean, Quiet, Circulating Water Taken From Top Drum

BACKED by a long experience gained in the manufacture of over 500,000 H.P. of Erie City 2-drum water tube boilers and of thousands of complete built-up boiler units, Erie City has incorporated side wall water cooling as an integral part of a low headroom 2-drum boiler. Outstanding of many features, is the method of obtaining a ring flow circulation, in each side wall element. A downcomer tube is provided for each pair of radiant (riser) tubes in the side wall, which, with two front wall downcomers assure an ample supply of clean circulating water in the water walls at all times. Insulation between riser and downcomer tubes keeps water at lower temperature in the downcomers while heat is rapidly removed from refractory through risers. Write for VL bulletin that clearly describes and illustrates this and many other features.



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Here's a new and different type of flexible metal hose scientifically designed to provide smooth flowing, flexible transmission of grain, dust, slag, insulation and other granular material. It is the new and revolutionary Penflex "TWIN-LOK"!
This new Penflex development offers all of the ruggedness of the well-known Penflex interlocked construction . . . plus an inner lining of metal that makes the inside of the tubing free of any obstructions . . . allows smooth, easy flow of material . . . reduces friction to a minimum. At the same time, this extra lining greatly reinforces the tubing without materially reducing the flexibility. Result is a new tubing that offers every industry-moving material pneumatically—real savings in time, money and maintenance.
Penflex "TWIN-LOK" is just another of the many developments of Penflex "Flexineering" which offers you complete service and products for the flexible, leak-proof transmission of liquids, air, gas or light solids. Penflex has a complete line of flexible metal hose, tubing and couplings from ⅛" I. D. to 30" for all purposes.
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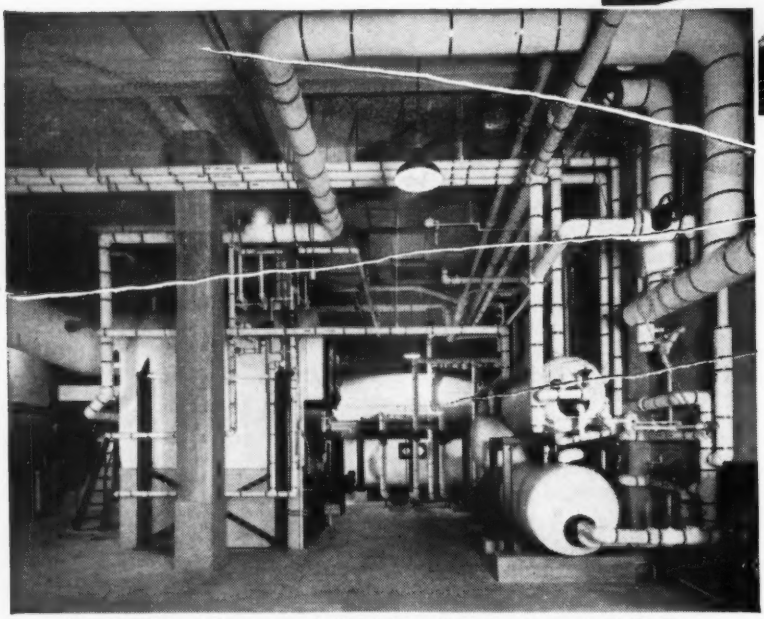
85% Magnesia Insulation

Outdoor installation of large Eastern brewing company. Steam lines covered with double standard thickness "Featherweight" 85% Magnesia Pipe Insulation and weatherproof jacket.



Indoor installation in boiler room of office building. Steam lines insulated with "Featherweight" 85% Magnesia Pipe Insulation and boilers insulated with K&M Insulating Cement.

This outdoor installation required especially dependable steam pressure control . . . since the equipment was part of a large brewing operation. K&M "Featherweight" 85% Magnesia Insulation was specified and excellent results obtained. The indoor heating system required efficient temperature control . . . "Featherweight" solved the problem here. Indoors or out . . . when it's an insulation job . . . that's the place for K&M "Featherweight" 85% Magnesia Insulation.

"Featherweight" 85% Magnesia Insulation combines the high insulating properties of basic Carbonate of Magnesia with asbestos fibers as a binding agent . . . forming a lightweight, fireproof, efficient insulating material.

K&M Distributors, located strategically throughout the country, are experts on the application of K&M insulating materials . . . and can point the way to savings for you. Write us for further information.

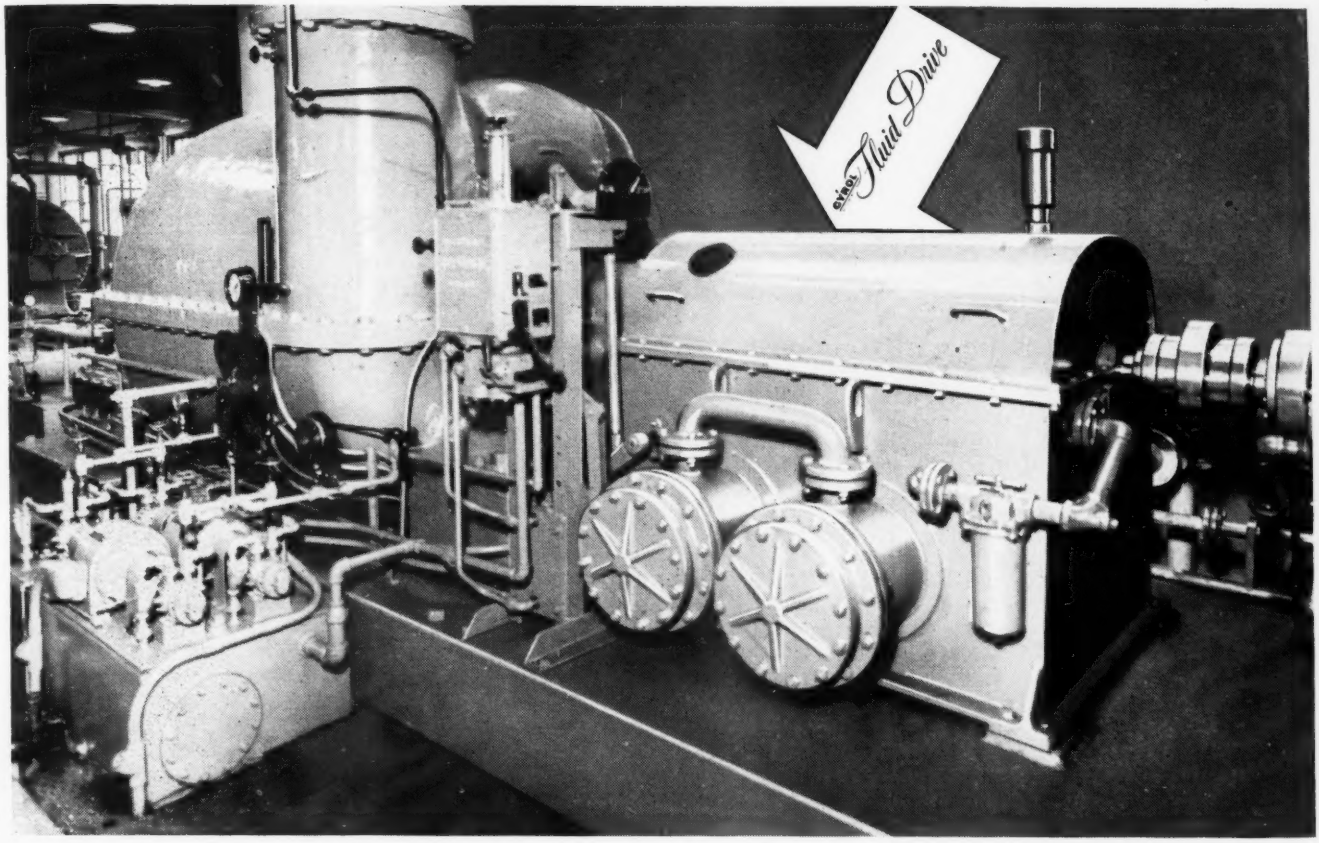
Nature made Asbestos

Keasbey & Mattison Company has made it serve mankind since 1873.

DIAMOND ANNIVERSARY 1873 K&M 1948 KEASBEY & MATTISON CO.

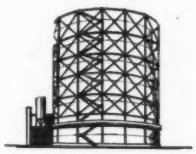
KEASBEY & MATTISON
COMPANY • AMBLER • PENNSYLVANIA

IN CANADA—ATLAS ASBESTOS CO., LTD., MONTREAL, TORONTO, WINNIPEG AND VANCOUVER



Type VS, Class 6 Gýrol Fluid Drive attached to gas supply booster.

Gýrol Fluid Drive saves power and protects machinery in gas industry



Maintaining the supply in a gas reservoir is a difficult job.

Gas consumption varies. Yet the pressure inside the reservoir must always remain constant. The gas supply booster, which refills the reservoir, must consequently vary the input to meet these fluctuations.

Here's where Gýrol Fluid Drive comes in.

Attached to the gas supply booster, Gýrol Fluid Drive provides stepless speed control that can be easily and accurately adjusted to keep the pressure up.

The Fluid Drive also allows no-load starting for the 1500 h.p. motor.

The advantages? Substantial savings in power, longer machine life and quieter operation. Power transmission with Gýrol Fluid Drive is completely foolproof, dependable and easy to operate.

Your business

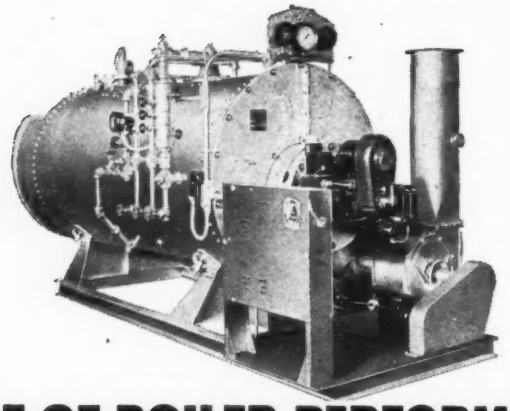
If you're concerned about power transmission in any plant or on products, or, if you want to improve the over-all efficiency of existing processes, investigate the unique advantages of Gýrol Fluid Drive.

Write today for information on Gýrol Fluid Drive or consult your nearest American Blower Branch Office. There is no obligation.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO
Division of American Radiator & Standard Sanitary corporation

AMERICAN BLOWER
GÝROL *Fluid Drive*

Serving home and industry
AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILER • ROSS HEATER • TONAWANDA IRON



PROOF OF BOILER PERFORMANCE:

REPEAT ORDERS

from....

ALLIED CHEMICAL AND DYE CORP.
ALUMINUM COMPANY OF AMERICA
ASSOC. LAUNDRIES OF AMERICA, INC.
AUSTIN COMPANY
JOSEPH BANCROFT AND SONS CO.
CANADA DRY GINGER ALE, INC.
CHESAPEAKE AND POTOMAC TELEPHONE CO.
CITY OF NEW YORK
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CRANE COMPANY
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E. I. DU PONT DE NEMOURS AND CO.
GULF OIL CORP.
HABITANT SOUP COMPANY
JOHNSON AND JOHNSON
LUX CLOCK MFG. CO.
NATIONAL BATTERY CO.
PEPSI-COLA BOTTLING CO.
RUTGERS UNIVERSITY
SPERRY PRODUCTS, INC.
STATE OF NEW JERSEY
UNITED CARR FASTNER CORP.
...AMERICA, INC.

These leading American enterprises—with complete confidence—re-ordered Preferred Unit Steam Generators. Why? . . . because they knew *from their own experience* that Preferred features assure them economical, trouble-free, long-life performance.

HERE ARE 7 MORE REASONS FOR REPEAT ORDERS:

★ INDUCED (PULL-THROUGH) DRAFT*
Eliminates need for costly stack . . . prevents escape of combustion gases into boiler room.

★ FULLY AUTOMATIC OPERATION
Even with No. 6 Oil.

★ PREFERRED ROTARY OIL BURNER
Built by Preferred especially for this unit.

★ FOUR-PASS GAS TRAVEL
Results in maximum heat absorption.

★ 80% MINIMUM THERMAL EFFICIENCY
Proved and guaranteed.

★ LOW MAINTENANCE
The result of over 27 years of combustion engineering experience.

★ FULL RANGE OF SIZES
From 20 to 500 H.P. and pressures up to 250 lbs.

* An example of the engineering "extras" behind Preferred's performance record is Induced (Pull-through) Draft. This distinctive feature permits air to be drawn around the outside of the refractory lining, thereby cooling the refractories and pre-heating the air. Combustion is aided . . . the life of the refractories is lengthened.

For complete details, write today for Bulletin 1000-F.

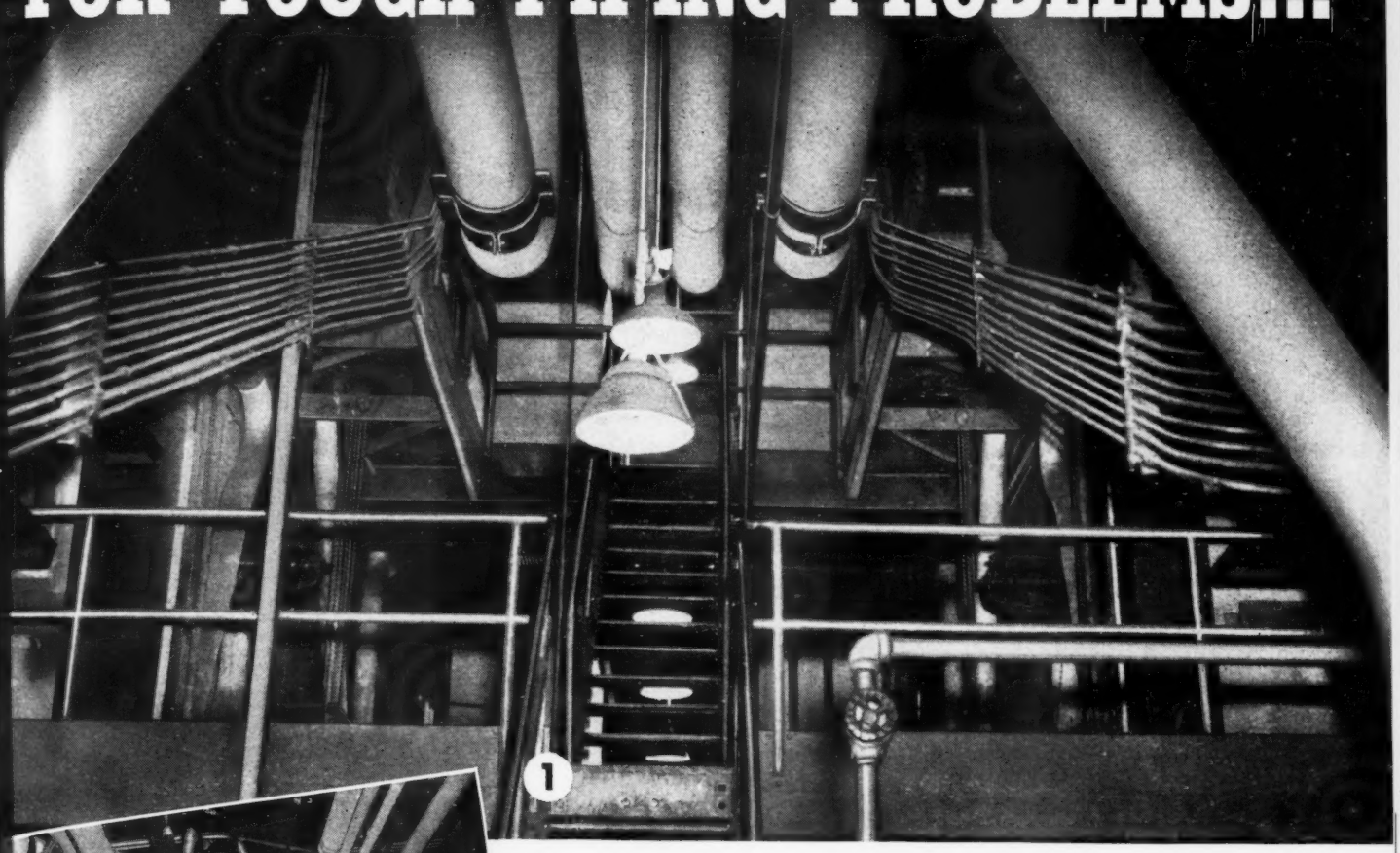
Two-pass 15 lb. pressure units available in 20-30 H.P. Minimum 75% thermal efficiency.

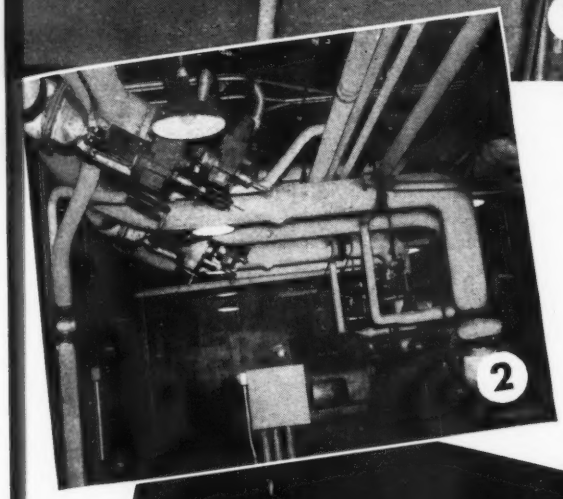
PREFERRED UTILITIES MANUFACTURING CORP. 1860 BROADWAY, NEW YORK 23, N. Y.

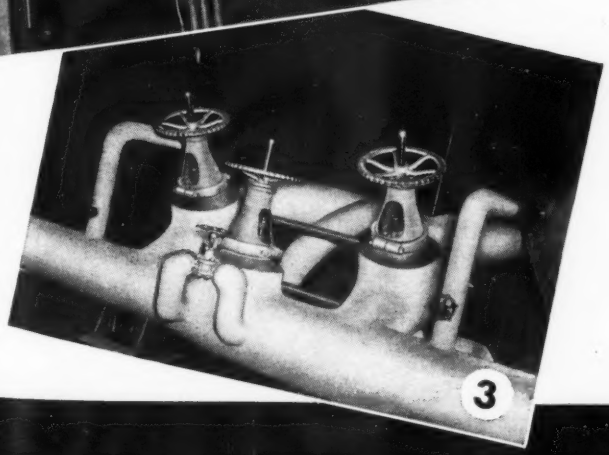
PR-172

PREFERRED UTILITIES MFG. CORP.

FOR TOUGH PIPING PROBLEMS...







Designing, fabricating and installing high pressure and high temperature power piping—demands skill, experience and responsibility of a high order.

Blaw-Knox Power Piping division specializes in the prefabrication of piping to carry steam, air, water and vapors where extreme conditions are part of specifications.

POWER PIPING

DIVISION OF BLAW-KNOX CONSTRUCTION COMPANY

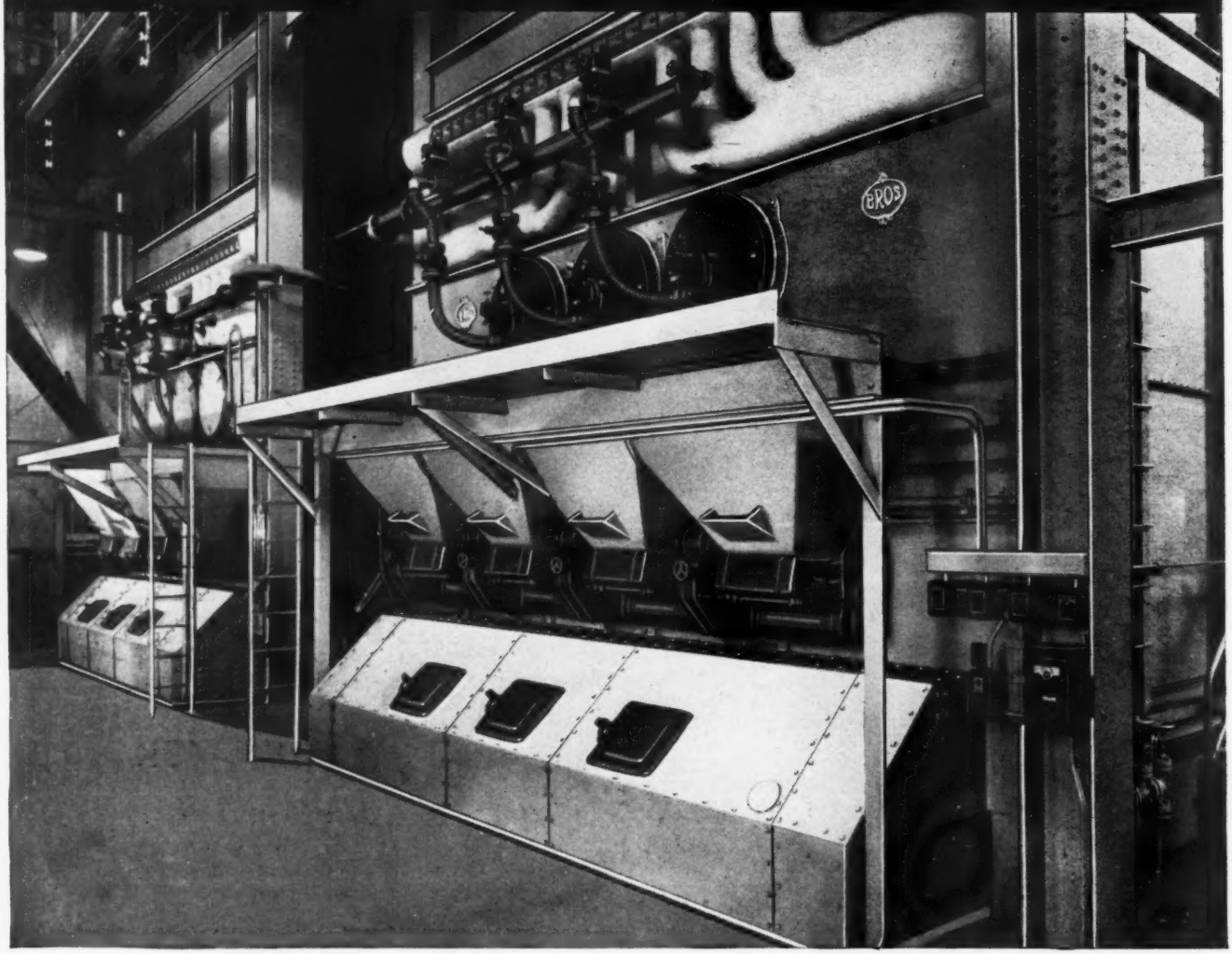
1525 Pennsylvania Ave., N. S., Pittsburgh 12, Pa.

Offices in Principal Cities

1. Control piping leading to instrument boards.
2. Boiler feed pumps and piping.
3. Main steam header and boiler branches under coal bunkers in a Wisconsin power plant.

BLAW-KNOX POWER PIPING

One furnace...three fuels



SWITCH TO COAL, OIL OR GAS IN A MATTER OF MINUTES

● *Bros* engineers have achieved this remarkable new fuel flexibility by designing a steam generating unit fired by *Bros Travl-Spred* continuous ash discharge spreader stokers and combination gas and oil burners.

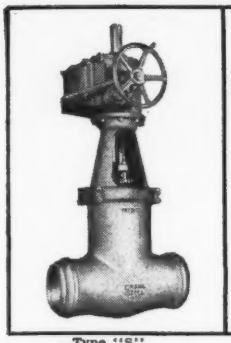
This is *Bros*' answer to today's critical problem of fuel availability. And it can free you, as a manufacturer, from the imminent threat of short supply—whether it be coal, oil or gas. For with this *one* furnace, you can use *three* fuels—and switch from one to the other easily, simply, in a matter of minutes!

In the installation pictured (B. F. Nelson Mfg. Co., Minneapolis), these two *Bros* 90,000 lb. combination units supply continuous power and process steam for the manufacture of roofing paper.

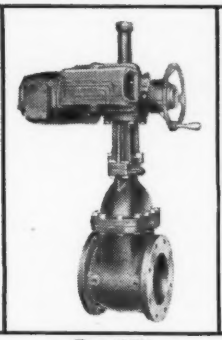
But whatever you manufacture, you can eliminate costly shut-downs due to fuel availability problems just as the B. F. Nelson Mfg. Co. has. The first step is a letter to Wm. Bros Boiler and Mfg. Co., Minneapolis, Minnesota, for complete specifications and details on this new *Bros* Combination Unit.

BROS

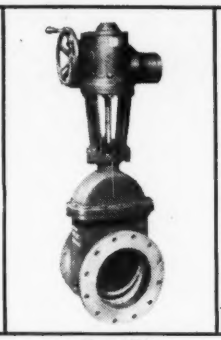
WATER TUBE, FIRE TUBE BOILERS • OVER FEED, UNDER FEED • HYDRAULIC-TRAVL-SPRED STOKERS



Type "S" LimiTorque on Crane Pressure-Seal Valve

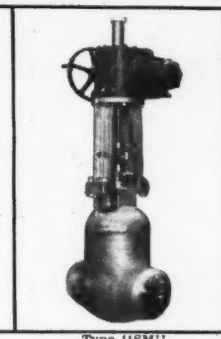


Type "M" LimiTorque on Jenkins Gate Valve

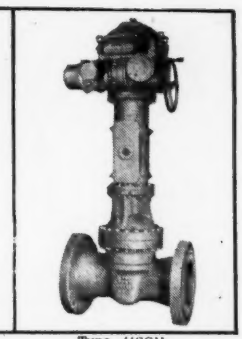


Type "S" LimiTorque on Darling Gate Valve

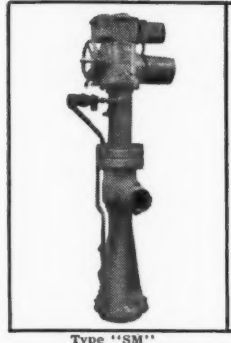
Type "SM" LimiTorque on Ludlow Gate Valve



Type "SM" LimiTorque on American Chain & Cable Co. (RP&C) Gate Valve

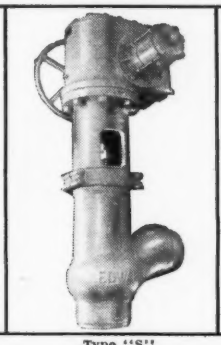


Type "SC" LimiTorque on Crane Venturi Gate Valve

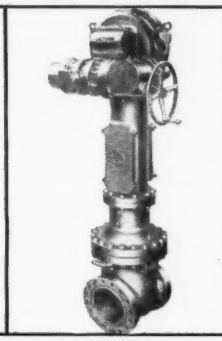


Type "SM" LimiTorque on Schutte & Koerting Reducing Valve

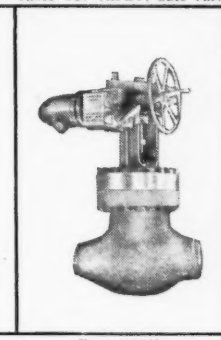
Type "SM" LimiTorque on Rennselaer Inside Screw Gate Valve



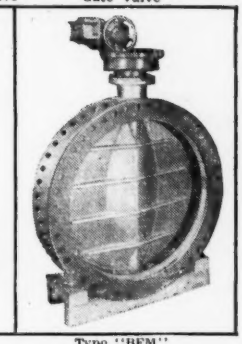
Type "S" LimiTorque on Edwards Angle Valve



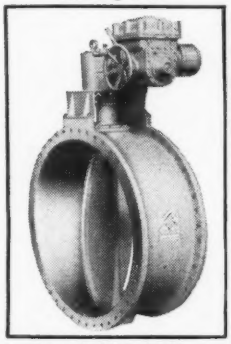
Type "SC" LimiTorque on Powell Gate Valve



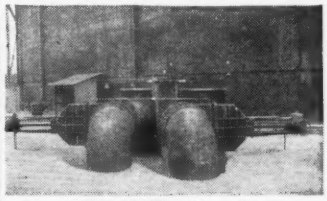
Type "GS" LimiTorque on Edwards Roller Non-Return Valve



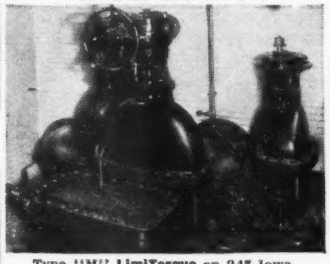
Type "BFM" LimiTorque on Phillips (Henry Pratt Co.) Butterfly Valve



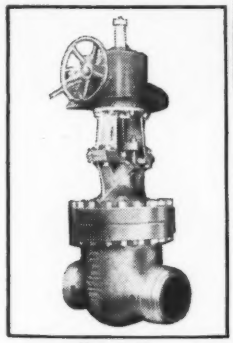
Types "S" & "M" LimiTorque on R-S Butterfly Valve (in tandem operation)



Type "SM" LimiTorque on Chapman 30" & 36" Gate Valves



Type "M" LimiTorque on 24" Iowa Gate Valve



Type "S" LimiTorque on Walworth Valve

Limitorque

MOTOR-OPERATED VALVE CONTROLS

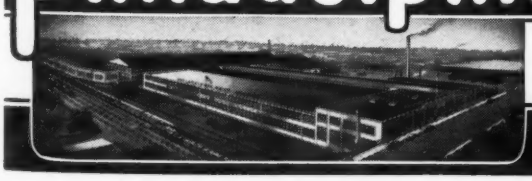
. . . are widely used on many different makes of valves

"*LimiTorque*" operates by the "push of a button," from either remote or nearby control panel . . . prevents damage to stem, seat, disc, gate or plug, because the Torque Seating Switch limits the torque, and thereby, shuts-off the motor, *before* trouble can occur. Thousands are in daily use on land and sea.

LimiTorque Controls may be obtained through Valve Manufacturers.

There's a Reason for Such Widespread Acceptance

Philadelphia Gear Works, INC.



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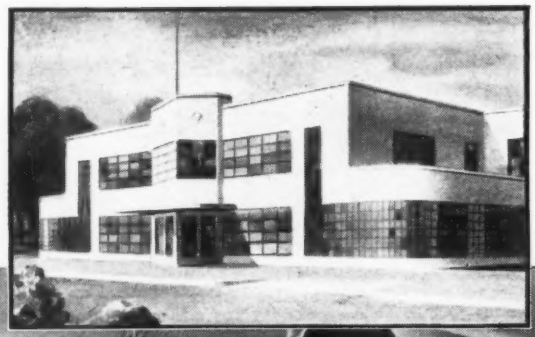
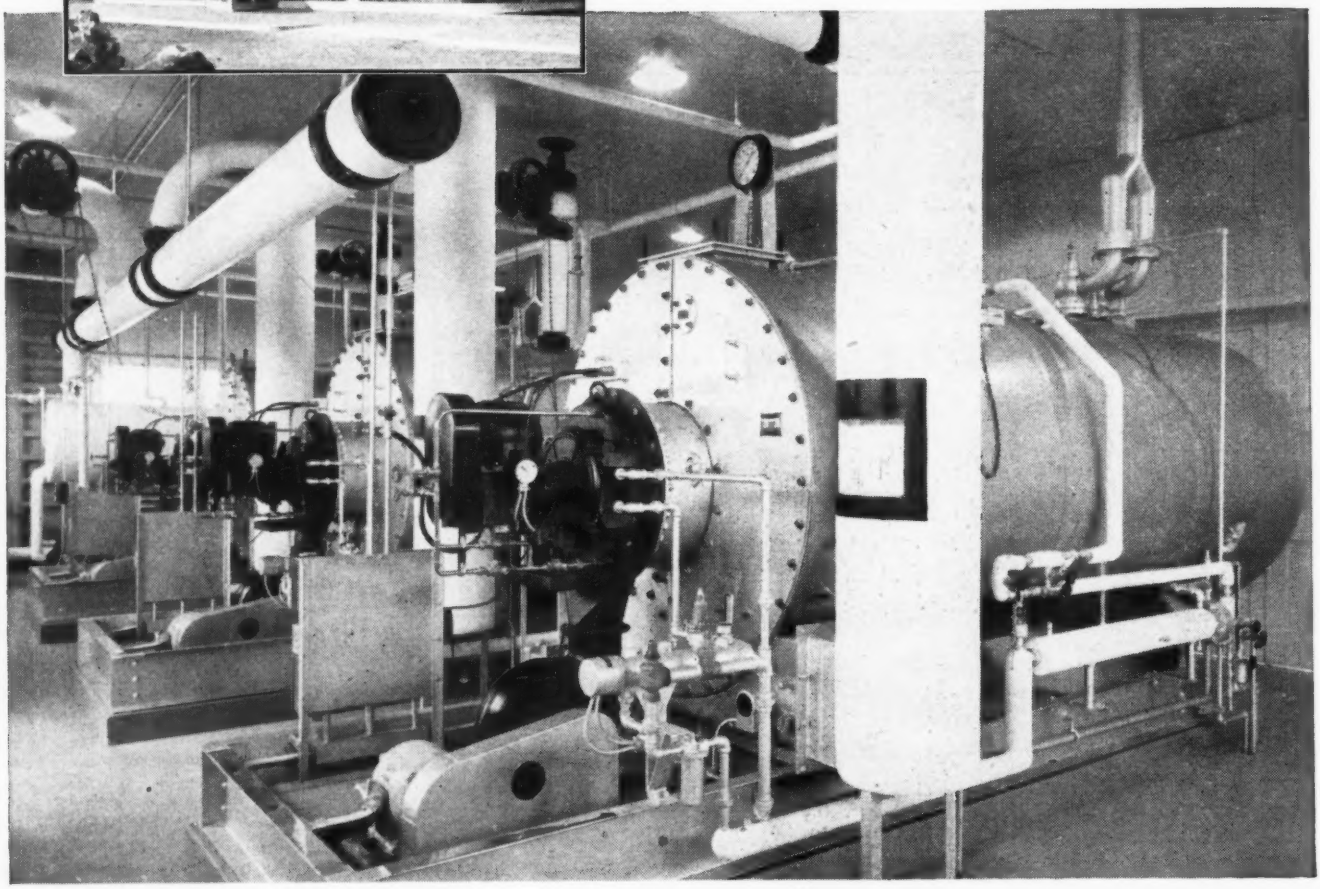
NEW YORK • PITTSBURGH • CHICAGO

IN CANADA: WILLIAM AND J. G. GREEY LIMITED, TORONTO

Industrial Gears and Speed Reducers
LimiTorque Valve Controls



MODERN PLANTS DESERVE STEAM PLANTS EQUALLY AS MODERN

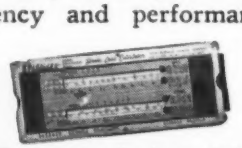


THERE'S more than meets the eye in today's new business and industrial plants. Beneath their attractive, streamlined exteriors, processes and operations are planned for the last word in efficiency.

And the steam source is no longer a messy, unkempt nether region, the stepchild in appearance and care that it used to be. Modern, oil or gas-fired Cleaver-Brooks steam generators — smokeless, ashless, and of peak efficiency and performance — transform the "boiler-room" into a show-place—its appearance in keeping with the structure it serves.

Cleaver-Brooks are the pioneers of "packaged" steam generators, available as gas or oil-fired models or models equipped with combination burners for alternate use of gas or oil fuel—built in sizes 15 to 500 h.p., pressures from 15 to 200 p.s.i., for single, multiple, or several "spot location" installations. Write for bulletin and complete information.

CLEAVER-BROOKS COMPANY
332 E. Keefe Avenue
Milwaukee 12, Wisconsin, U. S. A.



WRITE on your business letterhead
for Free Steam Cost-Calculator — a ready-reference slide rule showing the comparative steam costs when using oil, gas or coal as fuel.

Cleaver-Brooks
STEAM
GENERATORS

Custom-planned —

Every Cleaver-Brooks Steam Generator is built to the measure of an individual plant's needs, and Cleaver-Brooks assumes full responsibility for the satisfactory selection and initial operation of the unit.

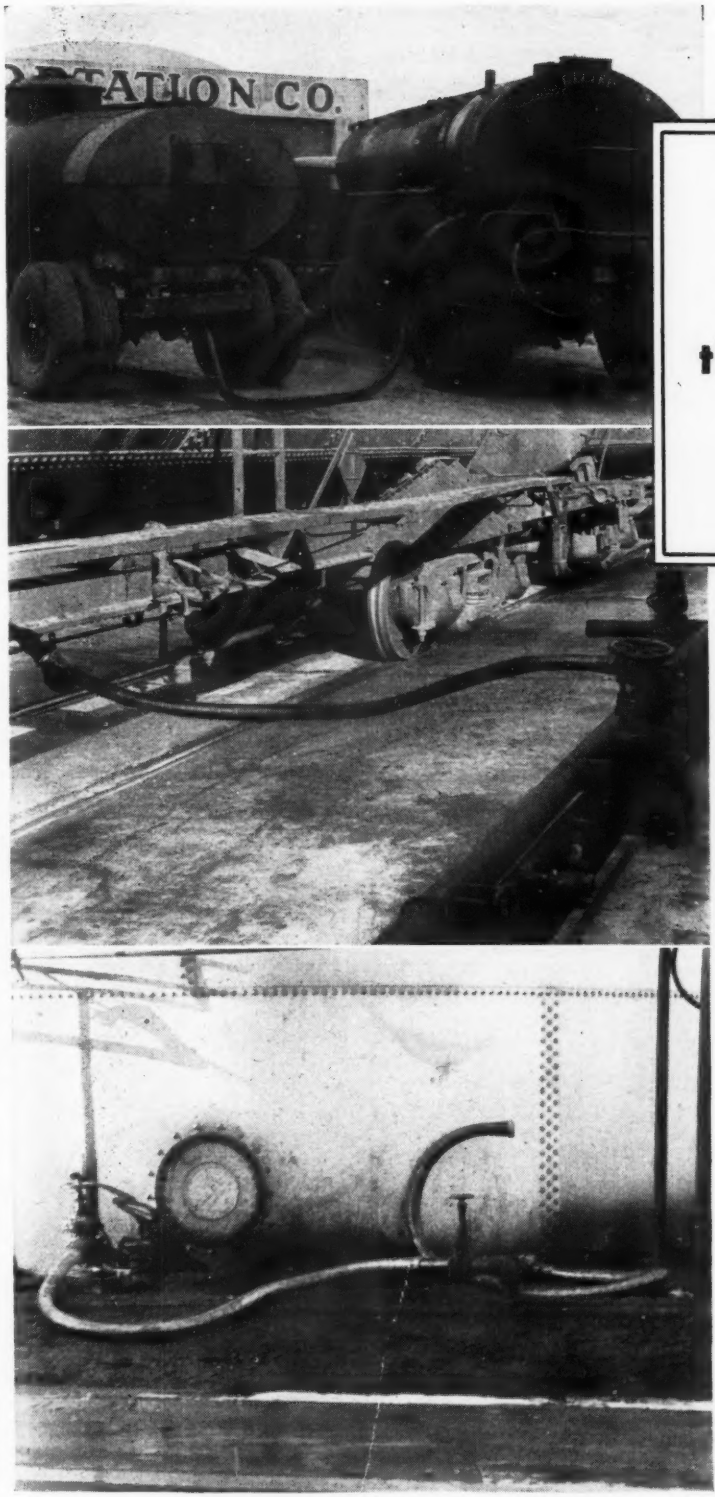
A qualified engineer analyzes load conditions, space and machinery arrangements. After installation, a factory engineer puts the steam generator into operation and trains plant employees on its operation, care and maintenance.

Self-contained and "packaged"

Delivery consists of a "packaged" unit. Connections to service outlets are all that is needed. No smokestack is used — a simple vent carries away all products of combustion. No extra foundation is required. Compact — the unit fits into limited space and low headroom locations. Sizes: 22 models — 15 to 500 HP; pressures 15 to 200 lbs. p.s.i.

Money-making performance —

The Cleaver-Brooks Steam Generator is designed for easy operation and low upkeep cost. Operation is at guaranteed 80% efficiency from full load down to 30% of its rating. The high heat transfer from the 4-pass boiler produces fast steaming. A boiler room as clean as the home or office is possible through the use of oil or gas as fuel.



CMH REX-TUBE Type RT-15

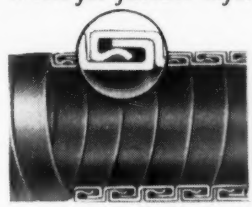
the economical, dependable fully interlocked flexible metal hose

CMH REX-TUBE, Type RT-15, flexible metal hose offers users seven important advantages which add up to dependability with economy—

(1) HIGHLY FLEXIBLE—Fully interlocked construction.
(2) DURABLE—Manufactured of bronze or steel.
(3) VERSATILE—Suitable for conveying steam, tar, asphalt, vegetable oils, hydrocarbons, as examples.
(4) NON-AGING—Durable metal construction.
(5) NON-CONTAMINATING—Corrosion resistance of metal.
(6) NON-COLLAPSIBLE—Does not collapse or get out of round, hence maintains full flow area.
(7) NO JOINTS TO PACK—The hose takes the motion, not the couplings.

Write today for complete information on how Rex-Tube RT-15, can serve you economically and dependably. Data sheets and specifications furnished on request.

Rex-Tube is part of CMH's complete line of flexible metal hose and related products. Write for further information.



REX-TUBE TYPE RT-15 —Fully interlocked flexible metal hose. Sizes ½" thru 12", I.D. Suitable for temperatures to 600°F and pressures to 500 psi.

"FLEXON" identifies CMH products, which have served industry for more than 45 years.

"the science of FLEXONICS . . . "the controlled bending of thin metals for use under varying conditions of temperature, pressure, vibration and corrosion" . . . is exemplified in the basic products of Chicago Metal Hose Corporation.

CMH FLEXIBLE METAL HOSE

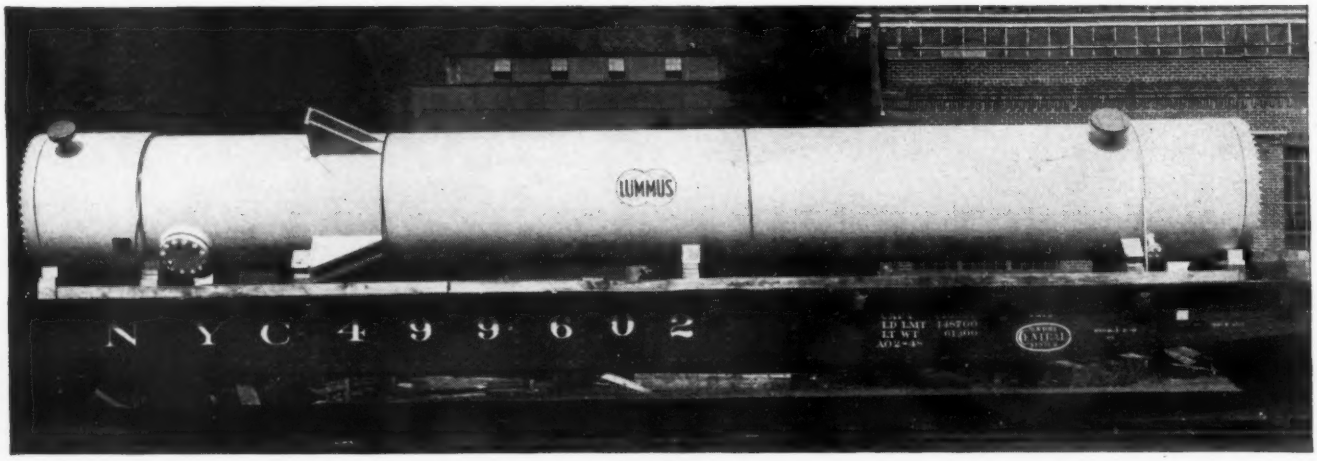
CHICAGO METAL HOSE CORPORATION

Maywood, Illinois

Plants at Maywood, Elgin and Rock Falls, Illinois

In Canada: Canadian Metal Hose Company, Limited, Brampton, Ontario

Its closures show how you will save with MULTILOK®



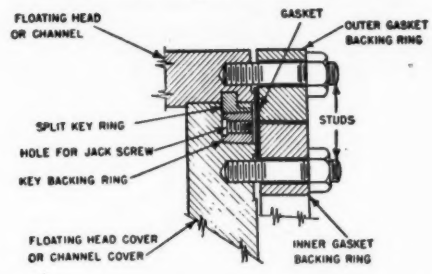
One of two identical Lummus units now in service at a well known refinery. Operating pressure, 1,050 psi. Tube surface, 3,140 sq. ft. Shell, 48 in. diam. Length over-all, 35 ft. Sure, tight closures are Lummus patented Multilok design.

This catalyst reactor is only one of many types of high-pressure equipment that have the advantages of Lummus patented Multilok Closures. These trouble-saving, cost-saving closures are used on feed water heaters, refinery, chemical, and general industrial high-pressure units—both with stationary and with floating heads.

Lummus heat exchangers are operating through wide temperature ranges at pressures varying from high vacuum to extremely high pressure. Conventional through bolting and backing ring construction are used for low and intermediate pressures. Multilok is used for pressures of 750 psi and higher.

For highest operating efficiency with lowest maintenance, have Lummus bid on all your heat exchanger requirements.

TYPICAL MULTILOK ASSEMBLY



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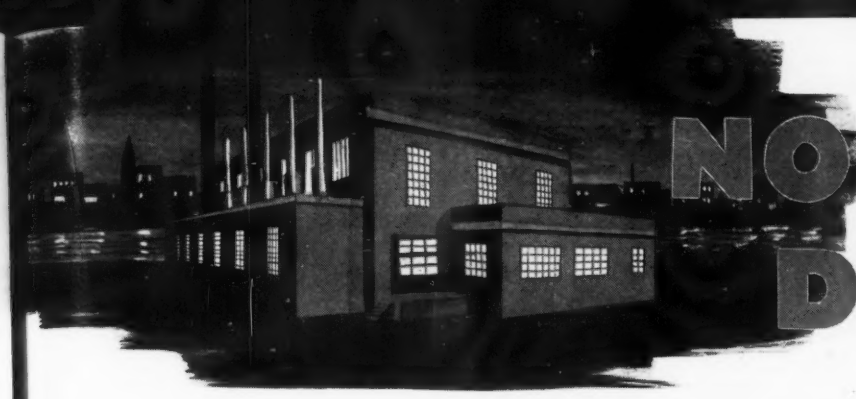

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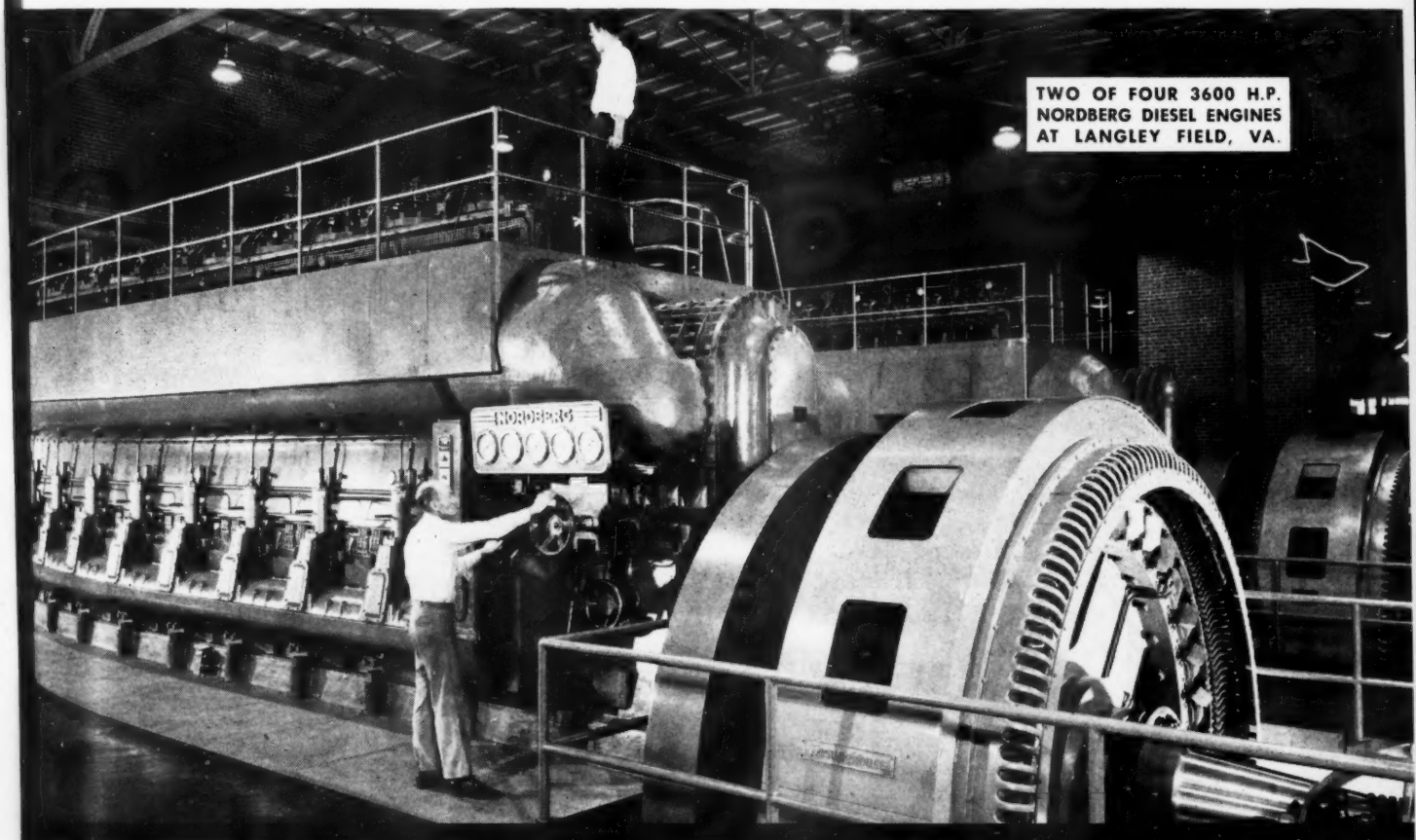

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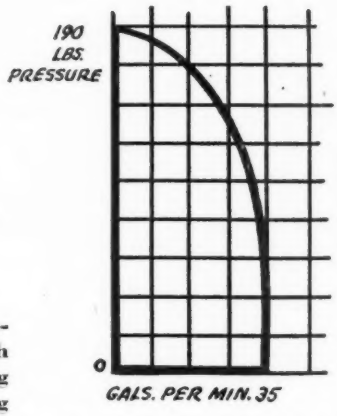

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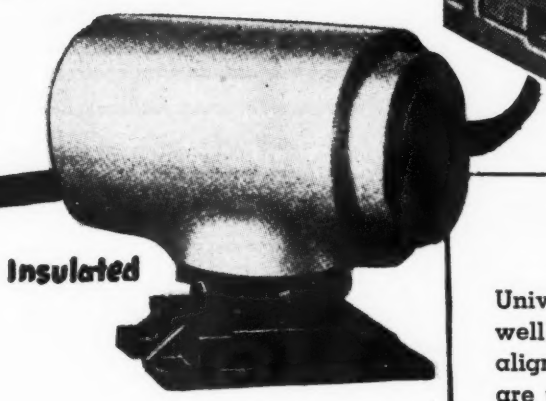

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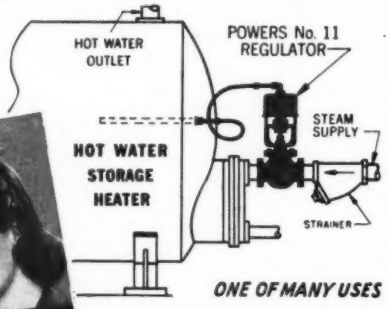

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Lengthening Condenser Tube Life

by Reducing Corrosion Pitting (Deposit Attack)

Since corrosion pitting ranks high as a cause for premature failure of condenser tubing, it is worth-while for every power plant engineer to give this type of corrosion special consideration.

What is Pitting?

This discussion is confined to pitting resulting from deposits of foreign matter in the condenser tubing, such as sand, sawdust, mud, stones, cinders, shells, corrosion products, etc.

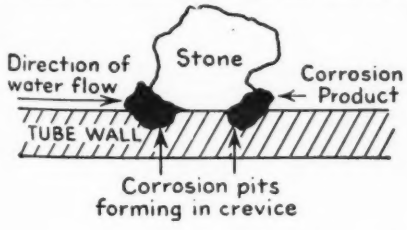
Contrary to what might be expected, the metal beneath or around the deposit of foreign substance or corrosion products is rapidly attacked while the adjacent areas of metal which have no deposits are only comparatively slightly corroded. Also, the continued accumulation of corrosion products helps to produce deeper pits or to enlarge the areas being corroded. Eventually, pitting may perforate the tube wall within a much shorter time than the over-all corrosion rate would indicate.

While studying this problem in the laboratory it was possible to produce pits practically at will by placing bits of cotton or corrosion products on metals submerged for a period of time in salt solutions.

Effect of Solid Deposits

When deposits are solid, non-porous substances such as shells, stones, etc., corrosion pitting does not take place directly beneath the object but rather in the crevices formed where the object comes

Figure 1. Diagram showing the result of deposit of solid, inert material on condenser tube wall.



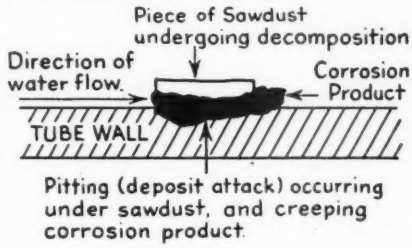
in contact with the tube wall. (See Figure 1.) Symmetrical or irregular rings of corrosion pits are formed beneath a layer of corrosion product.

Effect of Porous Deposits

When semi-porous deposits such as bits of wood, cloth, paper, fish or corrosion products are in contact with the tube surface, corrosion pitting may take place, quite uniformly spread around under the deposit. (See Figure 2.) With uninhibited high-zinc alloys plug-type dezincification may develop instead of pitting.

Pitting beneath semi-porous deposits involves complicated reactions as well as the destructive effects of various decomposition products from substances attached to the condenser tube wall. For example, when barnacles attach themselves to the tube wall, then die, their decomposing tissues form acid substances which greatly accelerate pitting.

Figure 2. Diagram showing the result of a deposit of porous material on condenser tube wall.


Piece of Sawdust undergoing decomposition
Direction of water flow.
Corrosion Product
TUBE WALL
Pitting (deposit attack) occurring under sawdust, and creeping corrosion product.

In some cases power plant operators, as an emergency procedure, force sawdust into the condenser when salinity indicators show contamination of the condensate. The idea, of course, is that particles of sawdust lodge in the holes, thus plugging the leaks. However, there is evidence that this procedure may lead to pitting beneath particles of sawdust which lodge elsewhere in the tubes.

Effect of Temperature and Water Composition

Generally speaking, in warm water, susceptibility of condenser tubing towards pitting increases appreciably. The higher temperature of cooling water in the summer is one of the factors contributing towards more rapid corrosion during that season. Power plants located in southern areas generally experience higher rates of attack than those located in cooler climates.

In some cases, as water temperature rises, bacterial activity increases, resulting in the formation of such gases as hydrogen sulphide, ammonia, carbon dioxide, methane, etc., in sufficient concentrations to greatly accelerate corrosion pitting.

Effect of Alloy Composition

No condenser tube alloy is immune to pitting. However, this type of corrosion is affected to a limited extent by alloy composition. For example, with Aluminum Bronze, after pitting has progressed to a certain point, the attack, in some waters, seems to be stifled by the corrosion product. In the case of Aluminum Brass, pitting frequently is slowed down after it has progressed to a certain degree. Cupro Nickel in clean sea water shows a tendency to form broad, shallow pits rather than small narrow ones. In these cases the economic advantages of using heavier walled condenser tubing is evident. (See September, 1948 Copper Alloy Bulletin.)

Preventive Measures for Reducing Deposit Attack

Since foreign matter is responsible for corrosion pitting, it is obvious that its entrance into the condenser should be prevented in so far as possible. The following measures are frequently used:

1. Long intake tunnels or channels which allow much foreign matter to settle out before it reaches the condensers.
2. Baffles in intake tunnels which are an effective means of keeping floating debris from entering the plant.
3. Stationary and rotating screens, which are desirable for keeping out such foreign matter as stones, shells, cinders, wood, fish, seaweed, etc.
4. A program of periodic cleaning with such procedures as the use of high pressure air or water; cleaning with brushes, rubber plugs, etc.; cleaning with various chemical solutions. The value of these procedures will vary according to local conditions.
5. Chlorination which helps to prevent the formation of slime.

Once pitting has begun there is no certain method of arresting it. Therefore, it is of vital importance to carry out preventive measures constantly, to make sure that deposit attack does not obtain a foothold. Experience has shown that where tubes are kept clean, pitting can be reduced considerably and the life of tubing greatly lengthened.

Bridgeport's laboratory will be glad to help power plant engineers by examining tube samples and discussing their corrosion problems. Write laboratory for instructions regarding the preparation and marking of condenser tube samples. Contact the nearest Bridgeport office for service, and write for 120-page Condenser Tube Manual covering available alloys, corrosion data, methods of installing, specifications and suggestions for increasing tube life.

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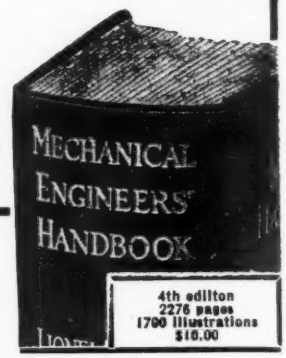

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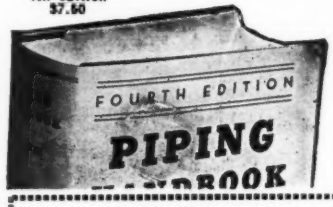

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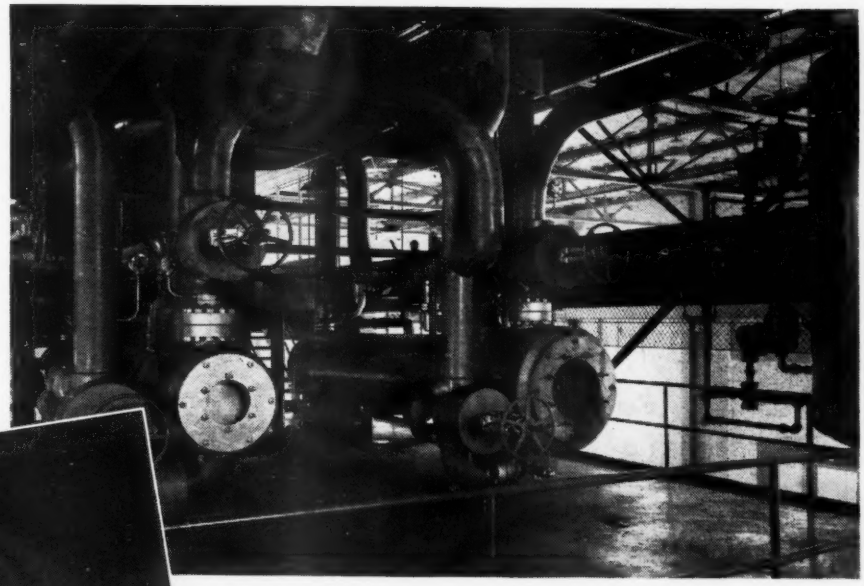

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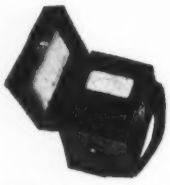

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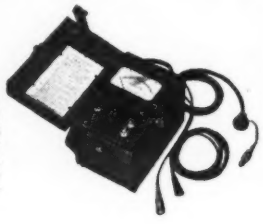

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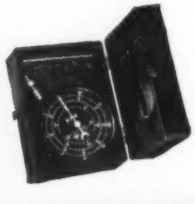

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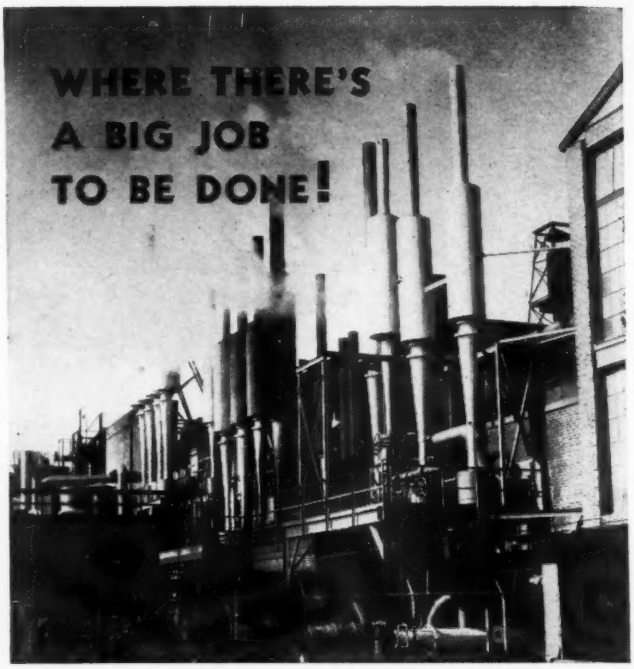

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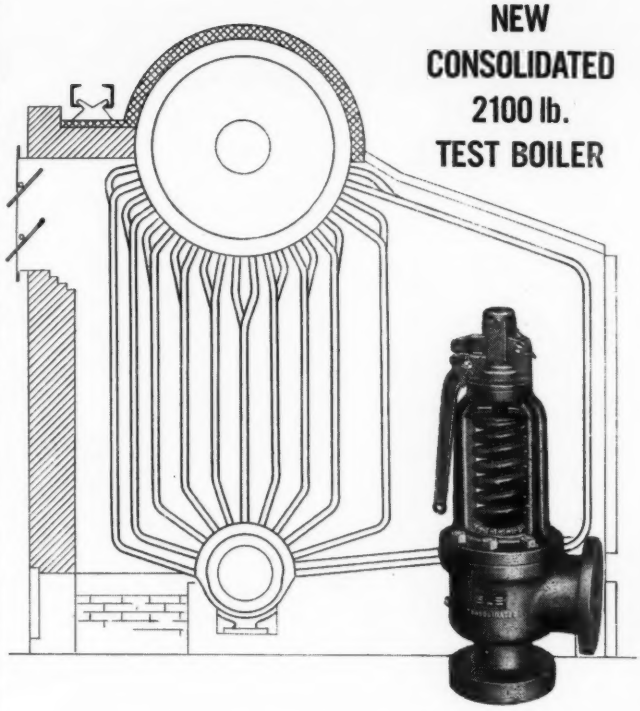

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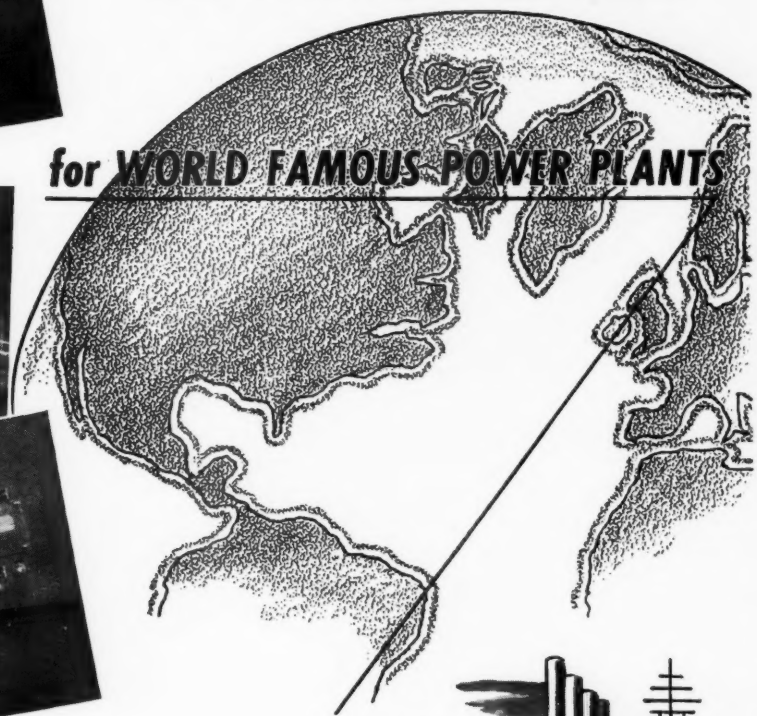

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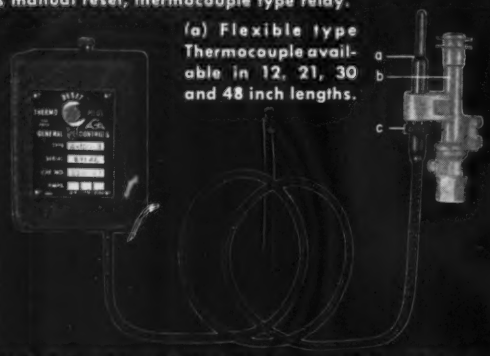

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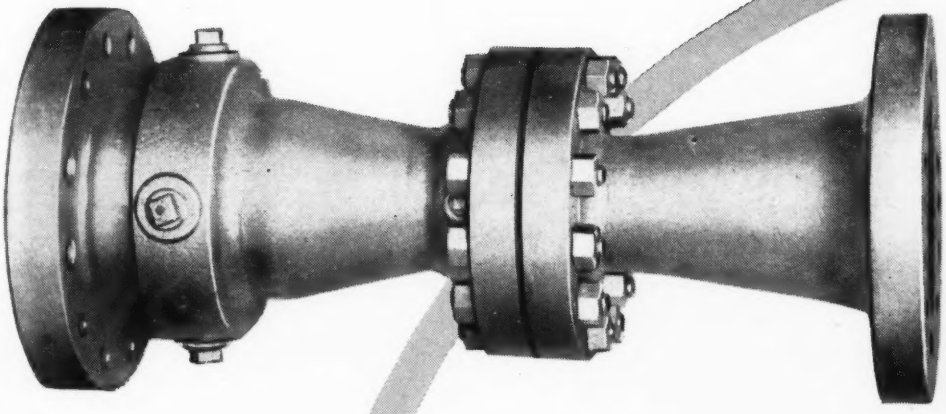

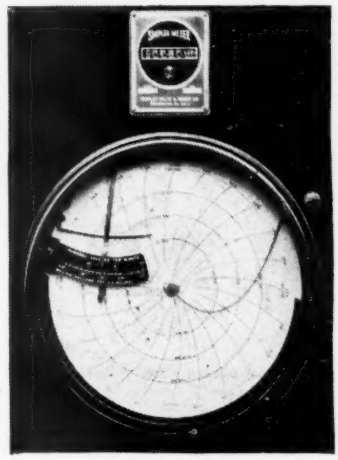

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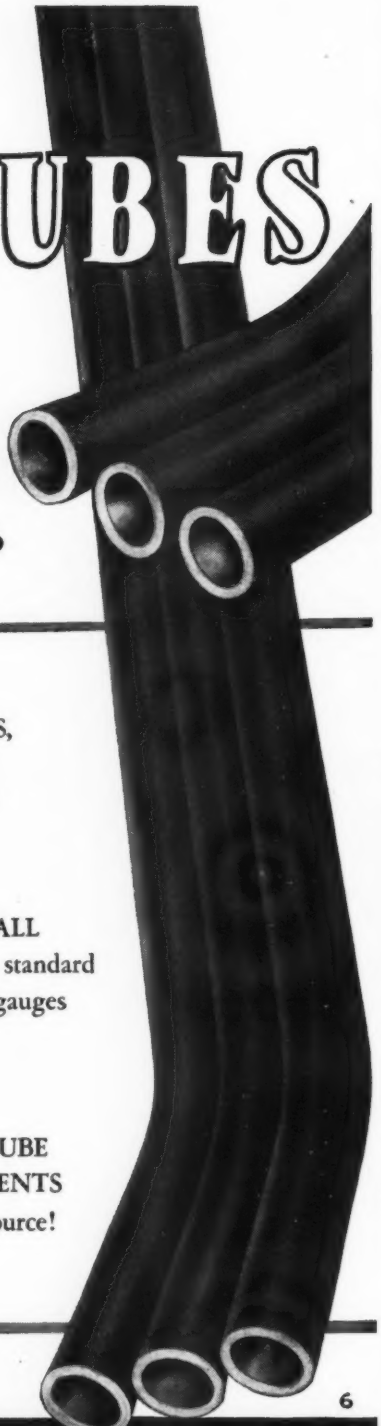

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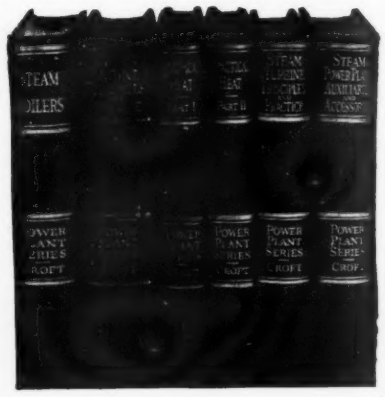

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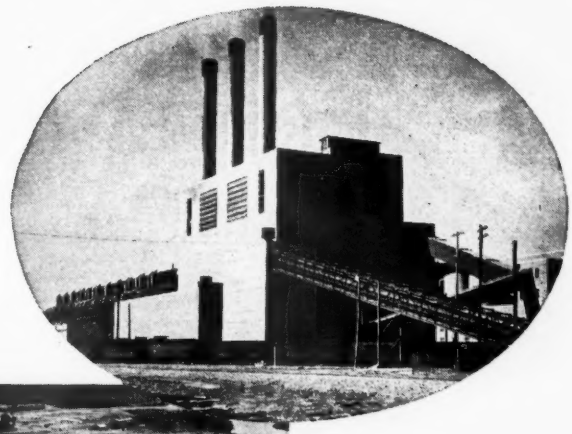

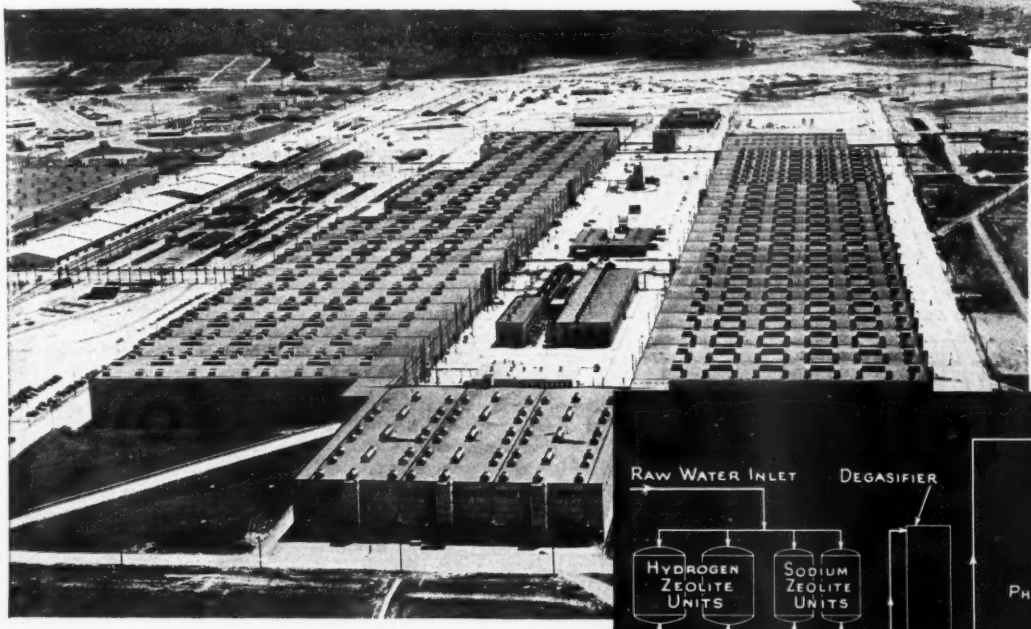

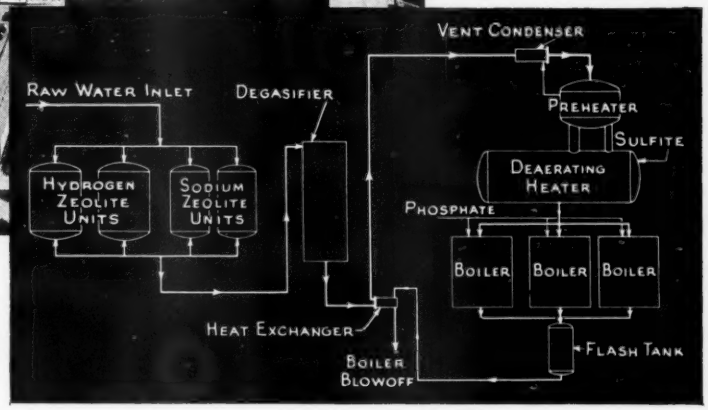

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used equipment-rebuilt and tested by our electrical engineers — to N. I. S. A. standards

TRANSFORMERS

1—Auto, 500 KVA, Packard, 3 phase, 4150 volts, 2—2300 volts.
3—300 KVA, Pitts., 2300 V. Pri., 115/230 V. Sec.
2—300 KVA, G.E., type H, 2300 V Pri., 115/230 V Sec.
300 KVA, Pitts., 7800-440 v.
205 KVA, Whse., 2 phase, 2300 to 3 ph., 4150 autp
200 KVA, Pitts., 4000 v.—110/220.
4—150 KVA, G.E. KS 2300 V. pri., 115/230 V. sec.
100 KVA, Pitts., 1375/2750 v.—110/220.
3—100 KVA, Wagners, 240/120 v.—120 v.
2—100 KVA, Newark, 440 v., 2 phase to 220 v., 3 phase.
2—100 KVA, Whse., 13,800 v. to 250 v.
3— 75 KVA, G.E., 2400 v.—120/240.
6— 50 KVA, Whse., 2400 v.—120/240.
6— 50 KVA, Whse., 13,800 v. to 125 v. or 250 v.
6— 50 KVA, Whse., 6900 v. to 125 v. or 250 v.

A. C. GENERATORS

2500 KVA, Whse., Syn. Cond., 720 RPM, 2400 v.
500 KW, .8 P.F., 3600 RPM, ATB, 600 v.
320 KW, Allis, 450 RPM, 480 v.
240 KW, G.E., ATB, 600 RPM, 600 v.
200 KVA, Allis, 3600 RPM, 240 volt.
200 KVA, Whse., 600 RPM, 240 v.
180 KW, Whse., 514 RPM, 550 v.
165 KW, El. Mach., 514 RPM, 240 V.
100 KW, G.E. ATB, 600 RPM, 240 v.
75 KW, Whse., 900 RPM, 220 v.
62½ KW, Allis, 3600 RPM, 220 v.
7— 50 KVA, Whse., 900 RPM, 220 v.
3— 35 KWA, Columbia, 1200 RPM, 240 v.
1— 31.3 KVA, America, 1200 RPM, 120/208.
15 KW, Star, 1800 RPM, 220/440.
12.5 KVA, Whse., 1200 RPM, 240 v.

TURBINE BLOWERS

1—Spencer Turbine Blower, 1000 cubic feet, 30 oz. pressure with a 15 H.P., 3600 RPM, General Electric Type FT, 200 volt motor.

1—Bellmore, 550 cubic feet, 7 inch vacuum, with a 20 H.P. 3600 RPM, General Electric, Type K, 220 volt 3 phase motor.

MOTORS, 3 Phase, 60 Cycle

SQUIRREL CAGE

750 H.P., General Electric, 750 RPM, 6600 v., 25 cycle.
450 H.P., Ridgeway, 900 RPM, 2200 volts.
125 H.P., G.E., KF, 1750 RPM, 2200 v.
125 H.P., U.S., 1200 RPM, Vert., 220 volts.
150 H.P., G.E., KT, 1200 RPM, Vert., 220 volts.
75 H.P., West., CS, 1750 RPM, 440 volts.
60 H.P., Whse., 900 RPM, Vert., 2200 volts.
60 H.P., Whse., 900 RPM, 440 volts.
2— 40 H.P., G.E., 900 RPM, 220 volts.
35 H.P., Whse., 1200 RPM, CS, 2200 volts.
35 G.E., 600 RPM, 550 volts.
25 H.P., U.S., 1800/1200/900/600, 440 volt.
2— 10 H.P., Whse., Gear 440 RPM, 440 volt.

MOTORS, 3 Phase, 60 Cycle

SLIP RING

450 H.P., G.E., 425 RPM, ITC, 440 volts, 25 cycle.
200 H.P., G.E., MT, 440 volt, BB, 720 RPM.
100 H.P., G.E., IM, 440 volt, 25 cycle, 720 RPM.
75 H.P., Whse., CW, 720 RPM, 440 volt.
75 H.P., G.E., MT, 1200 RPM, Vert.
50 H.P., G.E., MT, 600 RPM, 220 volt.
2— 50 H.P., Whse., CW, 900 RPM, 220 volts.
40 H.P., Cont., 1200 RPM, JA85, 220 volt.
40 H.P., G.E., 1200 RPM, MT, 220 volt.
40 H.P., G.E., 900 RPM, 220 Volt, ITC.
40 H.P., G.E., 900 RPM, MT, 900 RPM, 220 volt.
40 H.P., G.E., 900 RPM, 2200 volt.

AIR COMPRESSORS

312 CFM, 100 lb. Ingersoll Rand, model 75, with motor.
795 CFM, 150 lb. Chic. Pneu. Duplex, with synchronous motor.

LARGE STOCK OF
D.C. MOTORS AND GENERATORS

SYNCHRONOUS MOTORS

4—200/100 H.P., Whse., 720/360 RPM, 4150 V.
200 H.P., Whse., 600 RPM, 240 v.
1—150 H.P., G.E., 1800 rpm., 220 V., TS.
3—150 H.P., G.E. type T.S., 450 RPM 440 v.
75 H.P., G.E., 1200 RPM, 440 v.
70 H.P., Elect. Mach., 180 RPM, 2200 v.
40 H.P., Whse., 1800 RPM, 220 v.
35 H.P., G.E., 1200 RPM, 2200 v.
20 H.P., Whse., 1800 RPM, 220 v.

MOTOR GEN. SETS

1—1000 KW, G.E., 275 volts—4150—720 rpm. Syn.
1—1000 KW, G.E., 600 volts—4150—720 rpm. Syn.
1— 500 KW, G.E., 250 V. 900 RPM, 2300 V. Syn.
1— 500 KW, G.E., 575 V. 900 RPM, 2300 V. Syn.
125 KW, CW, 125 v., 1200 RPM, 2300 v. sq. cage.
100 KW, El. Mach., 125 v., 1200 RPM, 4150 v. syn.
100 KW, G.E., 230 v., 900 RPM, 4150 v. syn.
2— 75 KW, G.E., 125 v., 1200 RPM, 220/440 v.
6— 75 KW, G.E., 60 v., 1200 RPM, 220/440 v.
50 KW, Ridgeway, 550 v., 1200 RPM, 220 v.
25 KW, G.E., AT1, 1800 RPM, 40 HP, 1800 RPM, 230 v.

PLATING M. G. SETS

250 amp., G.E., 5/6 volt, 220 v.
500 Amp., Hansen Van Winkle, 24 volt, 220/440 v.
2500 Apm., Chandeysson, 6/12 v., 400 RPM, Syn., 440 v.
3000 Amp., Chandeysson, 6/12, 400 RPM, syn., 440 v.

ENGINE GEN. SETS

150 KVA, G.E., Ames Uniflow, 220 v., 3 ph., non-cond.
2— 5 KW, Gasoline, Hobart, 1800 RPM, 120 v., 1 ph. cont. engines.
1—200/275 H.P. Gasoline Engine, Van Blerck, 8 cylinder, 1500/900 rpm.

TURBO. GEN. SETS

625 KVA, Westinghouse, 2400 v., 3 phase, non-con.
300 KW, G.E., ATB, 240 v., 3 ph., cond.
60 KW, Whse., 120 v., D.C., cond.
30 KW, Allis, 120 v., D.C., Terry non-cond.

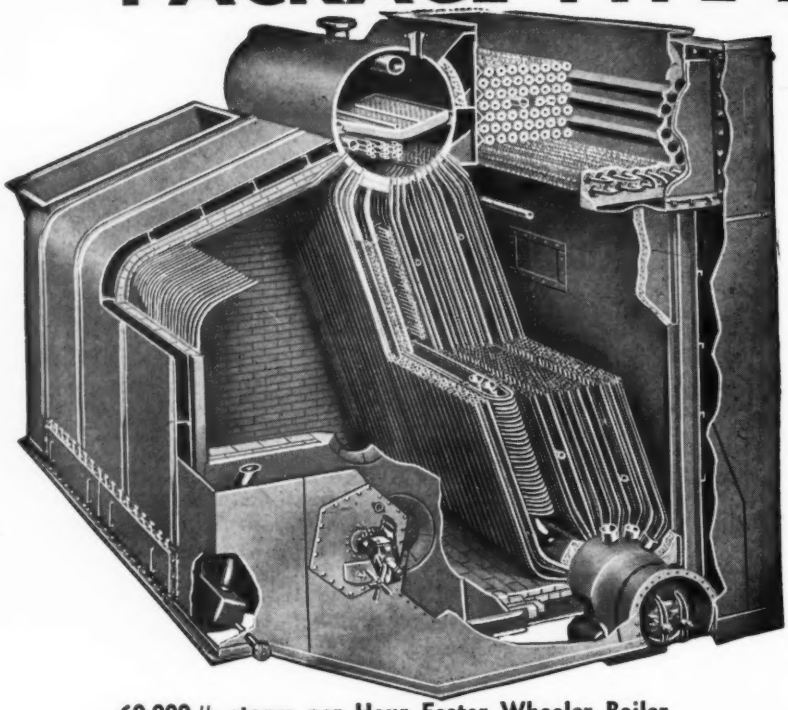
STEAM TURBINES

500 HP., G.E., 3 stage, 165#, 3240 RPM.
800 HP., Terry Tandem type, 720 RPM, red. gear.

JLHCo
THIS SEAL IS YOUR GUARANTEE

"FOR POWER"
J. L. HEMPHILL & CO.
1604 53rd STREET, NORTH BERGEN, N. J.
PHONE NEW YORK—LONGACRE 5-3227
PHONE NEW JERSEY—UNION 3-2600

PACKAGE TYPE BOILERS



60,000# steam per Hour Foster Wheeler Boiler

4—60,000# steam per hour Foster Wheeler steel-encased boilers, modified "D" type, two drum, bent tube, 435# pressure, 750 deg. total temperature.

Boilers equipped with waterwalls, superheaters, economizers, Swartwout feedwater regulators and Todd oil burners.

The above boilers were built new for the Government in 1943 and are in excellent condition. They are of the package type and can be shipped intact on underslung railroad flat cars.

ENCLOSED SYNCHRONOUS MOTORS

3500 HP General Electric Synchronous Motor

8—3500 HP Unity P.F. General Electric totally enclosed synchronous motors type TSM form HL 3 phase 60 cycle 1700 volts, 257 RPM.

Motors equipped with Griscom-Russell surface air coolers and couplings.

You will note the above motors are at present 1700 volts. However, they can be reconnected for 440 volts or rewound for 2300, 4000 or 6600 volts.

The above motors were built new for the Government in 1943 and are in excellent condition. They are self contained and can be shipped intact on underslung railroad flat cars.

INTERNATIONAL POWER MACHINERY CO.

UNION COMMERCE BLDG. Telephone: MAin 9514 CLEVELAND 14, OHIO

BELYEA SAYS: "BUY FROM THE OWNER AND GET A BETTER BUY"

RE-NU-BILT EQUIPMENT

Rebuilt in accordance with N. I. S. A. STANDARDS

MOTOR GENERATOR SETS

3 ph. 60 cycle

Qu.	KW	Make	Speed	D.C. Volts	A.C. Volts
1	1800	G.E.	600	125/250	4000
1	1500	G.E.	600	600	2300/4150
1	1500	G.E.	360	275	2200/4400
1	1000	West.	514	250	4150
1	1000	Al. Ch.	720	450	2300
2	500	G.E.	720	600	2300/4150
1	500	G.E.	720	600	4400
1	500	G.E.	720	125	2300/4000
1	350	G.E.	900	125	50
1	300	G.E.	720	550	2300/4000
1	250	G.E.	720	275	2300/4000
1	250	G.E.	1200	250	440
1	150	Cr. Wh.	1200	250	440
1	100	G.E.	1170	125	220
1	90	G.E.	1800	60	220/440
1	75	Cr. Wh.	1160	250	220/440
1	75	G.E.	1180	125	2300/4000
1	60	Cr. Wh.	1750	250	220/440
1	60	Whse.	1150	60	220/440
1	50	G.E.	1145	125	220
2	50	G.E.	1200	250	2200
1	50	G.E.	1145	125	220
1	48 (30)	G.E.	1750	60	440
1	45	G.E.	1200	60	220
2	35	G.E.	1200	120	440
1	25	Whse.	1750	125	2300

SYNCHRONOUS CONDENSERS

Qu.	Kva.	Make	Type	Volts	Speed
1	5140	Whse.		4150	600
1	4000	G.E.	TSC	2400/4800	900
1	3000	Whse.		4800	720
1	3000	G.E.	ATI	4800	720

ROTARY CONVERTERS

60 Cycle

KW	Make	Speed	D.C. Volts	A.C Volts
1—1000	Whse.	900	600	11000
1— 750	Whse.	900	600	13200
1— 500	Whse.	900	250	2300

FREQUENCY CHANGER SETS

1—1000 KW—GE—2 Unit—3 Brg. Consisting of—1400 HP—4400 V, 3 ph. 25 Cy. Motor and 1000 KW—2300 V. 2 ph. 58.3 cycle gen. with exciter (Gen can be reconnected for 800 KW 3 ph.)

1—320 KW—GE—2 Unit—3 Brg. consisting of 600 HP—440 V., 3 ph. 60 cy., 8 pf. Syn. Motor and 400 KVA .8 pf. type AT—3 ph. 120 cy. 720 volt AC generator with direct connected exciter.

D. C. MOTORS

HP	Make	Type	Volts	Speed
6—1500	Whse.		525	600
1—1200	Whse.		600	425
1—800/1000	Whse.		450	600/720
1—700	G.E.	MCF	600	150/525
1—650	G.E.	MPC	250	115/145
1—300/400	G.E.	DYNA	250	1325/2500
1—335	Whse.	MQ	250	300/900
1—250	G.E.	MPC	230	400/500
1—230	Al. Ch.		230	700
1—80/180	G.E.	MPC	240	400/1000
1—150	G.E.	MPC	230	250/450
1—150	Cr. Wh.	CCM	230	300/1050
10—150	Cr. Wh.	83H	230	890
1—150	Cr. Wh.	CMC-65H	230	1150
2—125	G.E.	CO-1832	230	625
1—125	El. Dy.	30S	230	750/1500
1—115	Cr. Wh.	JHL	230	1200
4—101	Whse.	SK	230	485/950
1—100	Whse.	SK-182	230	300/1200
1—50/100	G.E.	CD-175	230	365/730
1—80	El. Dy.	30S	230	500/1500
1—80	Whse	SK-180	230	450/1200
2—75	El. Dy.	25-SL	230	750/1750
3—60/75	Whse.	SK-200	115	300/700
8—75	Cr. Wh.	53-H	230	860
1—75	Cr. Wh.	CMC	230	1150/1760
1—60	El. Dy.	25-S	230	525/1050
2—60	Whse.	Holst.	230	415
1—60	Whse.	SK	230	500/1000
1—60	Whse.	SK-131	230	500/1500
1—60	El. Dy.	25S	230	750/1500
2—50	G.E.	RCP-31B	230	1700
1—50	G.E.	RC-34	230	1050
1—50	G.E.	RF-16	230	500/1500
1—50	Whse.	SK-131	230	500/1500
4—50	Whse.	Holst	230	400
1—50	Whse.	SK-153	230	690/1035
1—50	G.E.	CD-123	230	675/1035
1—50	Whse.	SK-170	230	350/1050
1—50	Cr. Wh.	CMC-8014	230	380/750
2— 40 Rel.		385-T	230	400/500

These units are semi-enclosed, b. brg. motors and part of complete V-S Drive with 40 KW Ind. M.G. Set with 220/440 v. A. C. Motor; exciter and complete control equipment. M. G. and control in steel enclosure.

SPECIAL—MERCURY ARC RECTIFIERS

1—750 KW—GE—Type RHW—6 Anode 575 V., D.C. Form C with 2300 V., 60 cycle transformer and switching equipment.

1—500 KW—GE—Type RHW—6 Anode 575 V., D. C. Form 8 with 2300 V., 60 cycle transformer and switching equipment.

Turbo Generators
See our advertisement on page 336

A. C. MOTORS

3 ph. 60 cycle

SYNCHRONOUS

HP	Make	Type	Volts	Speed
2—3500	G.E.	TS	2300	257
1—2100	G.E.	ATI	4600	510
2— 2000	Whse.		2300	120
1—1000	Whse.		2300	189½
1— 900	Al. Ch.	(New)	2200	150
1— 600	Whse.	Syn.	440	360
1— 500	G.E.	ATI	480	900
2— 500	G.E.	TS	4150	600
1— 450	Whse.		2300	128.5
2— 450	Whse.		2300	1800
2— 350	G.E.	TS	2200	150
1— 320	G.E.	ATI	2300	600
1— 300	G.E.	ATI	440	720
1— 150	G.E.	TS-7558	2200	720
1— 145	G.E.	ATI	550	720
1— 100	Whse.		550	600

SLIP RING

1—1000	Whse.	CW	2300	700
1— 900	G.E.	IM	2300	880
2— 700	Whse.	CW	2200	900
1— 500	G.E.	IP	550	505
1— 400	G.E.	IM	2200	252
3— 350	Whse.	CW	2200	900
1— 350	G.E.	MT-442Y	2200/4000	253
1— 300	Whse.	CW	440	1750
2— 300	Al. Ch.	3 Brg.	2300	505
1— 250	G.E.	MT-563Y	550	900
1— 250	G.E.	MT-424Y	4000	257
1— 250	G.E.	MT-559S	2200	1800
1— 135	G.E.	IM	2300	700
2— 100	G.E.	IM-16	2200	435
1— 75	Whse.	CW-761	2300	1750
1— 75	F.M.	By-H16B	2300	1750
3— 50	Whse.	CI-638A	220	870
2— 50	Whse.	CIW-504	440	870
1— 50	Rel.	1XM	2300	880
1— 50	G.E.	MT-352	550	600

SQUIRREL CAGE

1— 250	G.E.	IK	440	600
1— 250	G.E.	KT-559	440	1800
1— 200	(New) G.E.	K	2300	1200
1— 200	G.E.	IK	550	865
1— 125	(New) G.E.	KF-TEFC	440	1190
1— 100	G.E.	IK-Vert.	2300	450
1— 100	G.E.	KT-543	220/440	1750
1— 75	G.E.	K	2200	1200
2— 60	G.E.	K-505	440	1170
1—60/20	Whse.	CS	220	900/450
1— 50	G.E.	KF-405S	220/440	3550
2— 50	Whse.	CS	220	870
1— 50	G.E.	KT-327	2200	1750

With men who know machinery **it's been BELYEA CO., INC.**

Main Office and Shop
43 HOWELL ST., JERSEY CITY 6, N. J.
Phone—Journal Square 2-3334
Also N. Y. City Line—Rector 2-7150

for 40 years

and still going strong

GLOW

SQUIRREL CAGE MOTORS

HP	RPM	Volts	Make
350	514	440	GE-I
250	600	2300	Triumph
200	490	2200	GE
200	600	440	Westgh.-CS
125	340	220	A-C
100	1800	2300	Burke
100	1200	440	C-W
85	3600	2200	GE
75	900	2300	GE
75	720	2300	Wagner
75	360	220	GE-I
60	3600	2300	GE-KT
60	1800	440	Al. Ch.
60	1800	2300	GE-FTR
50	3600	440	R. & M.
50	1800	220	GE-KT
50	1200	220	GE-KT
50	900	220	GE
50	720	2300	Wtg.-CS
40	1200	220	GE-KT
40	900	2300	Wtg.-CS
40	720	440	GE-KT
35	900	220	GE-KT
35	600	220	FT. Wayne
30	1800	dual	Delco
30	1200	dual	Master
30	720	220	GE-HI
30	514	440	Stanley
25	3600	dual	L-A
25	1800	dual	GE
25	1200	220	Wesche
25	900	440	GE
25	900	220	GE-FTR
25	720	220	Wagner
25	600	440	GE-I
20	3600	dual	GE
20*	1800	220/440	Master
20*	1800	220/440	Wesche
20	1200	440	Al. Ch.
20	900	440	Wtg.-CCL
20	600	220	GE
15	3600	220	GE-KT
15	1800	220	W-E
15*	1800	220/440	Master
15	1200	220	Ridgeway

ENCLOSED SQUIRREL CAGE

HP	RPM	Volts	Make
125*	1200	440	GE-TE-FC-BB
60	900	440	GE-TE-FC-BB
40	1200	220	Westgh.
30	1800	dual	Delco
30	1200	440	Wagner
20	1200	440	Wagne.
20	900	440	GE-TE-FC-BB
15	1800	dual	Delco
15	1200	220/440	Delco-TEFC-BB
10	1200	440	GE-TE-FC-BB
7½*	1800	dual	Wagner-TEFC-BB
7½*	1800	dual	Master-TEFC-BB
7½	1200	dual	GE-Hi Slip-TEFC-BB
7½	1200	dual	Delco
7½	1090	220/440	GE-KR, high slip
7½	900	dual	Delco-TEFC-BB
5	3600	dual	Delco-TE-FC-BB
5*	1800	dual	Master-TEI C-BB
5	1800	220	Wagner TE-BB
5*	1200	dual	GE-TEFC-BB
3	3600	440	Wtg.-TE-BB
3	1800	dual	Delco-TEFC-BB

*New Motor

ENCLOSED SQUIRREL CAGE—Cont'd.

HP	RPM	Volts	Make
3	1200	dual	Rel-TEFC-BB
3	900	dual	Delco
2	1800	dual	Delco-TEFC-BB
2	1200	220	GE-TE-BB
2	900	220	Wagner-TE-BB
1½	900	dual	Delco-TEFC-BB
1½	1800	dual	L. Al.-TE-BB
1½	1200	dual	Ref-TE-BB
1	3600	220	Haskins-TEFC
1	1800	dual	Master-TEFC-BB
1*	1800	dual	Delco-TE-BB
1*	1200	dual	Rel-TE-BB
¾	3600	4400	Delco-TE
¾	1800	dual	Wesche-TE-BB
¾	3600	220	Ohio-TE-BB
½	1800	440	Wtg.-TE-BB
½	1800	440	Delco-TE-BB
½	1800	dual	Delco-TE-BB
½	1200	220	Cr. Wh.-TE
½	900	dual	Delco
½	3600	dual	Delco
½	1800	dual	Delco

SLIP RING MOTORS

HP	RPM	Volts	Make
500	900	440	GE-3 Brg.
400	1200	2300	Al. Ch.
375	1800	2300	Al. Ch.
350	900	2300	Westg .
250	300	2300	Al. Ch.
235	1800	220	GE-I
60	1800	dual	Al. Ch.
60	900	2300	Burke
60	900	220	Wesche
50	900	2300	Ridgeway
50	900	440	Wagner
50	720	440	Al. Ch.
50	1800	220	GE-MT
40	1200	220	GF-MT-336
40	900	220	Wtg.-HF
40	720	2300	Wtg.-HF
40	720	220	Al. Ch.-ARY
40*	600	2300	Al. Ch. ARY
40	600	220	Al. Ch.-ARY
40	450	220	Triumph-C
35	1200	220	Westgh.
35	900	220	Al. Ch.
35	900	2300	Ridgeway
35	720	220	GE-I
30	1800	2300	Wtg.-CW
30	1800	220	GE
30	1200	440	Wagner
30	1200	2300	Lincoln
30	900	220	GE-MT
30	900	2300	Ridgeway
30	720	220	GE-I
30	600	220	F. Morse-BV
25	1200	2300	Al. Ch.-ANY
25	1200	220/440	Watson-KH
25	900	220	GE-MT
25	600	220	Watson

VERTICAL MOTORS

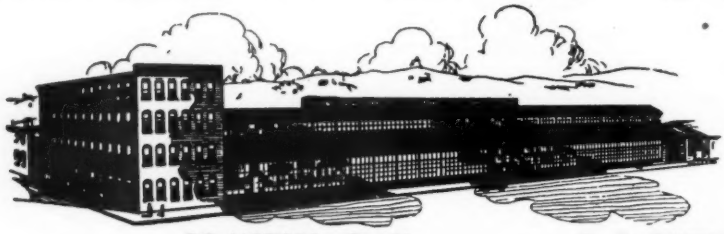
HP	RPM	Volts	Make
200	120(	440	Al. Ch.-SR
150	1200	2200	GE-I
150	1200	440	GE-Cage

VERTICAL MOTORS—Cont'd.

HP	RPM	Volts	Make
125	1200	2300	Al. Ch.-Cage
100	1200	440	GE-Cage
75	1200	2200	GE-Cage
75	360	220	Ideal-Cage
60	1800	230 D.C.	GE
60*	1200	440	Al. Ch.-Cage
50	1200	2200	Wtg.-Cage
40	1800	220	GE-Cage
40	1700	230 D.C.	GE
40	1200	440	Wtg.-SR
40	1200	220	GE-Cage
35	1800	440	GE-Cage
35	1200	2300	Al. Ch.-Cage
35	450	440	GE-Cage
30	1200	dual	Wtg.-Cage
25*	1550	230 D.C.	GE
25	1200	2200	GE-Cage
25	850	230 D.C.	Wtg.
20*	1800	440	Al. Ch.
20*	1200	440	Al. Ch.-Cage
15*	1800	440	Al. Ch.-Cage
15	1750	110 D.C.	Wtg.
15	1150	230 D.C.	GE
15	600	440	Al.-Ch.
12½	900	220	L. Al.-Cage
10	3400	230 D.C.	Wtg.
7½	1800	500 D.C.	Peerless
7½	900	440	Burke
7½	700	230 D.C.	GE
6	850	110 D.C.	Rei.
5	1400	230 D.C.	R. & M.
5	600	440	GE-Cage
4	1650	110 D.C.	Watson
3	1700	230 D.C.	Watson
3	1200	dual	Wtg.-Cage

SYNCHRONOUS MOTORS

HP	RPM	Volts	Make
3000	720	4800	GE-ATI
1015	500	2200	Wtg.-25 cycle
700	500	11000	GE-25 cycle
600	750	440	GE-25 cycle
500	600	4160	GE
350	750	4000	GE-25 cycle
250	225	2200	GE-TS
220	600	2300	GE-ATI
250	225	2200	GE
250	225	440	GE
200	225	2200	Wtg.
160	600	440	GE-ATI
115	164	208	GE
60	360	2200	GE
50	1200	440	Wagner
50	360	440	GE
30	900	440	Wagner
30	600	550	GE
30	450	dual	Wtg.
30	360	550	GE
30	327	220	E-M
25	1800	220	Wagner
25	450	220	E-M
25	300	220	Ideal
20	900	220	Wtg.
20	600	220	E-M
15	1800	220	Wagner
10	1800	220	Wagner
10	1200	220	Wagner
7½	1200	410	Wagner



D. C. MOTORS

115 Volts

HP	RPM	Description
325	750	GE-MPC
60	1200	Star
35	975	Northern
35	610	GE
30	1800	F-M
30	200/600	Sprague
25	1150	Triumph
25	750	GE
20	700	Triumph
20	500/1500	GE-RF11
20	400/1200	GE-RLC fr. 202A
15	1200	J. & L
15	1000	GE-CE
15	975	F-M
15	725	Westgh.-S fr. 6
10	700	J. & L.
10	650	J. & L. type CI
8	1500	Elect. Dynamic (series)
7½	3500	GE, type B
7½	1150	F-M, type CF
7½	975	Westgh.-S-3
7½	750	J. & L. type CI
7½	700	J. & L. type CI
7½	500/1500	Reliance-T-66T
7½	500	Westgh.-SK-BB
7½	170/220	Diehl-NG90
5	3600	Star-SF3-BB
5	1800	Wesche-BB
5	950	Swing-E-6

DC MOTORS—Cont'd

5	650/1950	Imperial-HVI
5	535/1070	C-W, type CMC
5	400/1600	Northern-S
5	260	Diehl-BB
2½	575	GE-RC
2½	300/1200	Reliance-34T
2*	3500	American, type I-BB
2	1200	Westgh-SK
2	1000	Triumph
2	900	Watson-AW4B
2	500/2000	GE-CD
1½*	1750	Marathon
1½	600/1800	Watson-BW
1½	500/1500	GE-RA
1	1725	B-B, type DM
1	1150	GE-RC
1	920	Peerless
1	700	F-M, type TR
1	780/1560	C-W, type CM
1	600	Northern

*New Motor

D. C. GENERATORS

125 Volts

KW	RPM	Description
500	750	GE-MCF
300	1500	GE-CC
100	1000	WE-DLC
100	900	C-W-CCD
80	500	J. & L.-G
80	400	J. & L.-G
65	1100	W-E, type ELC-7
60	1200	Star, type SQ single bearing
55	1000	GE-Type TD
35	1165	GE-DLC
31.25	1400	Westgh.-SK-single bearing

D. C. GENERATORS—Cont'd.

30	1200	Al. Ch., single bearing
25	1200	Westgh.-SK, single bearing
25	1100	GE-CI.
25	600	Westgh.-SK, frame 150
25	300	W-E, type B
15	3600	GE-BF
15	1100	Al. Ch
10*	1750	Westgh.-SK-43
9	1100	R. & M.
9	400	F-M
7½	3600	GE-BR
4	750	Westgh.-SK501.
2	1400	Westgh.
2	1200	Westgh.-SK

D. C. GENERATORS

230 Volts

KW	RPM	Description
400	1200	Westgh.
200	375	J. & L.-type K
175	450	Westgh.
125	1400	Westgh.-SK-1301.
80	1050	W-E
35	1800	GE-RC
30	300	Triumph
22½	765	Westgh.-SK
18	300	Burke
15	350	Westgh.-SK
15	250	GE-CD
5	850	Triumph
1½	900	J. & L.-AI-7

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AC & DC MOTORS • GENERATORS • PUMPS
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STEAM ENGINE GEN. SETS • SLIP RING MOTORS

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Another AGSCO DIESEL POWER INSTALLATION

IMMEDIATE DELIVERY

Installed and Engineered by A. G. SCHOONMAKER CO., INC., this 1250 KVA, 1000 KW Fairbanks-Morse Diesel Engine Generating Unit is in continuous service at the Park Falls, Wisconsin plant of the Flambeau Paper Co.

A PAPER PLANT like this one at Park Falls, Wisconsin, needs a lot to keep it in operation, but more than any other factor, Power is its life-blood. A. G. SCHOONMAKER engineers were called in to determine how much power was needed for peak operation. After concentrated study and research AGSCO reached a decision and carried through the job of supplying and installing the required capacity Diesel unit.

It is this kind of engineering "know-how" and service which has made A. G. SCHOONMAKER stand foremost in the Power Field for over 50 years.

AGSCO maintains a large inventory of Diesel Engine Generating Units in capacities of 10 to 1136 KW designed for heavy duty, continuous service. Write for bulletins and full information today.

A PARTIAL LISTING OF OUR INVENTORY

KVA	Make	Model	HP	RPM	KVA	Make	Model	HP	RPM
*1420	Fairbanks Morse	38D8 1/8	1600	720	375	Enterprise	DSG-6	450	450
*1250	General Motors	16-278A	1600	720	375	General Motors	8-268A	450	1200
1250	Nelseco	6M1-53	1500	300	312	Ingersoll Rand	S	385	600
1000	Fairbanks Morse	38D8 1/8	1200	600	312	Cooper Bessemer	FSN-6	375	900
*900	General Motors	12-567	1100	720	300	Fairbanks Morse	Y	360	257
625	Superior	OS	750	327	250	General Motors	8-268A	350	1200
*625	General Motors	8-278A	750	720	125	General Motors	3-268A	150	1200
500	General Motors	6-278A	600	720	100	Buckeye	E	150	325(BC)
469	Baldwin	VO-6	570	514	75	Fairbanks Morse	35E8 3/4	90	450(BC)
375	Worthington	DH-6	450	450	62	Int'l. Harvester	UD-18	76	1200

*ALSO AVAILABLE AS PORTABLE UNITS

Engineered AGSCO DIESEL POWER

A. G. SCHOONMAKER Company, Inc.

ESTABLISHED 1895

Diesel Engines • Power Machinery

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"CERTIFIED REBUILT"

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PUMPS . . . FANS . . . BLOWERS . . . SPEED REDUCERS

PARTIAL STOCK LISTING—WRITE, WIRE OR PHONE YOUR REQUIREMENTS

M-G SETS

KW	Mfr.	Input V	Out	Output V
150	Cr. Wheeler*	220/440 AC		250 DC
105	Century b.b.	220/440 AC		70 DC
100	Gen. Elec.*	220/440 AC		125 DC
100	Whse. converter	440 AC		250 DC
75	Whse.	220/440 AC		125 DC
75	Star b.b.*	220/440 AC		250 DC
75	Star b.b.	240 DC		230/460 AC
40	Whse.	220/440 AC		250 DC
40	El. Prod.	220/440 AC		125 DC
35	Gen. Elec.	220/440 AC		48 DC
30	Ideal	220/440 AC		125/250 DC
30	Marble Card	220/440 AC		60 DC
30	Elec. Prod.*	220/440 AC		50 DC
25	G. E. NEW	220/440 AC		125 DC
20	Whse.	220/440 AC		250 DC
20	Cr. Wheeler	220/440 AC		180 cycles
15	Gen. Elec.	220/440 AC		125 DC
9	H. V. W. 1500 Amp.	220/440 AC		6/12 DC

*Synch. motor drive.

D. C. MOTORS

H.P.	Mfr.	Type	Volts	Speed
150	Cr. Wheeler b.b.	TEFC	230	800
100	Whse.	SK181	230	450/900
75	G.E. New b.b. (2)	CDM	230	1750
75	Cr.W. New b.b.(5)	CMC	230	1150
75	Allis Ch.	E	230	500
75	Whse.	S13L	115	575
75	Gen. Elec.	BRC	115	1150
65	Gen. Elec.	C	230	375/750
60	Allis Ch. New b.b.	EB149	230	520/690
40	Gen. Elec.	RC32	230	1150
40	Whse.	SK	230	1700
40	Whse.	SK133	230	850
35/50	Gen. Elec.	CD123	230	575/1150
30	Whse.	S-7	115	900
30	Whse.	SK160	230	350/1000
30	Star b.b.	SB	230	7450
30	Gen. Elec.	RC31B	230	1150
25	Gen. Elec.	RC31	230	1150
25	Sprague dyna.	LC	230	750/2000
25	Chand'son (4)	C13	115	850
25	G.E. b.b. NEW	CDM93	115	1150
20	Gen. Elec.	RF12	230	400/1600
20	Whse.	SK93	230	1150
20	G.E. b.b. NEW	CDM83	115	1750
20	Gen. Elec.	RC11	115	1150
20	Reliance	T	230	850
20	Gen. Elec.	DLC	230	500/1500
20	Gen. Elec.	CD85	230	1150
15	Gen. Elec.	LC	230	550/1100
15	Gen. Elec.	RC	115	1150
15	Roth	85RS	230	1750
15	G.E. b.b. NEW	CDM67	115	1750
15	Gen. Elec.	RC10	230	1150
15	Whse. (5)	SK90	230	825

D. C. GENERATORS

KW	Mfr.	Type	Volts	Speed
600	Gen. Elec.	MPC	500	750
150	Cr. Wheeler b.b.	TEFC	250	1200
105	Century b.b.	1500a	70	1200
100	Gen. Elec.	RC17	125	1200
80	Reliance	T	250	1150
75	Allis Ch.	E	250	750
75	Whse.	S	125	600
40	Gen. Elec.	RC	250	1500
40	Whse.	SK	250	1150
30	Elec. Prod.	BB	50	1150
30	Gen. Elec.	RC	250	1500
30	Ideal 3 wire	HHR	125/250	850
25	G.E. NEW b.b.	CD93	125	1450
24	Whse.	SK	600	850
20	Reliance	T	250	1150
15	Gen. Elec.	RC	125	1200

EXPLOSION PROOF MOTORS—NEW

1—3 HP 1200 RPM	1—10 HP 900 RPM
2—7½ HP 1800 RPM	1—15 HP 1800 RPM
1—7½ HP 900 RPM	2—20 HP 1800 RPM
3—5 HP 1800 RPM	5— 5 HP 1200 RPM

A. C. MOTORS—25 CYCLE

H.P.	Mfr.	Type	Volts	Speed
300	Whse.	Synch.	2300	750
150	Whse.	Synch.	440	750
150	Whse.	HF	440	500
50	G.E. int.	MTC5337	440	750
50	Allis Ch.	ANY	440	1500
50	G.E.	I-K	440	750

A. C. GENERATORS—60 Cycle

KVA	Mfr.	Type	Volts	Speed
625	Gen. Elec.	ATB	2300	450
500	Allis Ch.	3 brg.	240/480	360
250	Whse.	G	2300	600
156	G.E. 1 brg.	ATB7558	240/480	1200
150	Allis Ch.	B	2300	900
125	Whse.	G	240/480	720
125	Gen. Elec.	ATB	240/480	300
125	Whse. 25 cycle	G	240/480	750
100	Whse.	G	2300	900
63	El. Machy.	180 cy.	240/480	1800
60	El. Machy.		240/480	900
56	Gen. Elec.	ATB	240/480	900
50	Cont. b.b.	S107	120/208	1200
31	Onan *New	GMCW	120/208	1800
25	Whse. b.b.	1 ph.	120/240	900
12½	Whse. b.b. NEW		240	1200

*Complete gasoline engine power unit.

A. C. MOTORS—SLIP RING

3 Phase 60 Cycle 220 or 440 Volts

Qu.	H.P.	Mfr.	Type	Speed
1—	600	Gen. Elec.	I-M	360
1—	450	G.E. 3 brg. 2200 V.	I-M	450
1—	300	G.E. 2200 V.	I-M	1800
1—	225	G.E. int. duty	MTC5564	600
1—	150	Gen. Elec.	I-M	450
1—	150	G.E. 2200 V.	I-M	1200
1—	150	G.E. int. duty	ITC-15	720
1—	150	Allis Ch.	ANY	600
1—	125	Wagner 2200 V.	RS	900
1—	100	Allis Ch.	ANY	1800
1—	100	Al. Ch. b.b. NEW	ARY	600
2—	100	Wagner 2200 V.	RS26V	1200
2—	100	Whse. int. 2200 V.	CI856C	600
1—	100	Allis Ch.	ARY	900
1—	75	G. E. int. duty	MTC5342	900
1—	75	Ideal int.	AVE	1200
1—	75	Gen. Elec.	MT558	600
2—	75	Gen. Elec.	IN-14	600
1—	75	Gen. Elec.	MT337	1800
1—	75	Allis Ch.	ARY	1200
1—	50	Howell	SR437	1200
1—	50	Fair Morse	BV	720
1—	50	Gen. Elec. int.	ITC	600
1—	50	Whse. int.	CI	600
1—	50	Gen. Elec.	I-M	720
1—	40	Gen. Elec.	MT336	900
1—	40	Allis Ch.	ANY	450
1—	40	Gen. Elec.	MT327	1800
1—	37	G.E. int.	ITC	600
1—	35	Lancashire	b.b.	1800
1—	30	Gen. Elec.	OMT336	1200
1—	30	Gen. Elec.	MT346	600
1—	25	Triumph	SR	1200
1—	25	Gen. Elec.	I-M	600
1—	20	G.E. int.	MTC5312	900
1—	20	G.E. b.b.	MT503	1800
1—	20	P & H b.b. int.	W18	1200
1—	20	Gen. Elec.	MT332	720
2—	20	G.E. int.	MTC5302	1200
1—	15	Gen. Elec.	MT502	1200
1—	15	P & H b.b. int.	W7	1200

A. C. MOTORS—SYNCHRONOUS

H.P.	Mfr.	Type	Volts	Speed
667	Gen. Elec.	ATI	2200	450
300	Whse.	G	2200/440	600
250	Ideal (2)	2BC-M4	2200	450
200	Gen. Elec.	ATI	220/440	900
150	Gen. Elec.	ATI	2200	450
150	Gen. Elec.	ATI	220/440	300
150	Gen. Elec.	ATI	220/440	600
125	Whse.	G	2300	900
125	G.E. splprf.	TS955	220/440	1200
100	American b.b.	YGH	220/440	900
75	El. Machy.	BRKT	550	900
60	Gen. Elec.	ATI	220/440	900

A. C. MOTORS—SQUIRREL CAGE

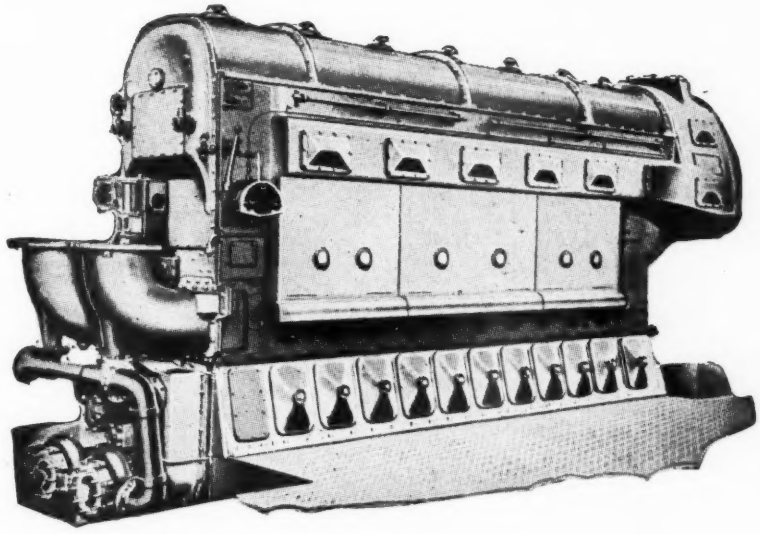
3 Phase 60 Cycle 220 or 440 Volts

Qu.	H.P.	Mfr.	Type	Speed
1—	200	Reliance b.b. NEW	C6085	1200
1—	200	Reliance b.b. NEW	C6085	1800
1—	150	Reliance b.b. NEW	14C6085	720
1—	150	Whse. 2200 V.	CS771-1C	1800
1—	150	Reliance b.b. NEW	B6085	1200
1—	150	Reliance b.b. encl.	AA	900
1—	150	Fair Morse	B	600
1—	125	Reliance b.b. NEW	C5085	1200
2—	125	Allis Ch. 2200V.	AN	1200
1—	125	Gen. Elec.	IK-16	450
1—	125	Cont. 2200 V. b.b.	SC	1800
1—	125	Rel. TEFC NEW	B6085	1800
1—	100	Rel. TEFC NEW	C5085	1200
1—	100	G.E. b.b. NEW	K504S	1800
1—	75	Reliance b.b. NEW	C5084	900
1—	75	Reliance TEFC NEW	C5084	1200
1—	75	Reliance b.b. NEW	C505	1800
1—	75	Gen. Elec.	KT329Y	3600
1—	75	Gen. Elec.	I-K	720
1—	75	Whse. hitorq	CS-607	1200
2—	75	Reliance b.b. NEW	C505	1200
2—	60	Reliance b.b. NEW	B504	1800
1—	60	Rel. TEFC NEW	C505	1200
2—	60	Reliance b.b. NEW	C504	1200
2—	60	Whse. H. T.	CS504	1800
1—	60	Wagner b.b.	RP444	3600
1—	60	Allis Ch. 4000/2200 V	AR623	1800
1—	60	Gen. Elec.	I-K	600
1—	50	Whse. b.b. NEW	CS405S	1800
1—	50	G.E. 2 phase	I-Q	900
2—	50	G.E. NEW b.b. HT	KG405	1800
2—	50	Reliance b.b. NEW	C445	1200
2—	50	Gen. Elec.	KT336	1200
1—	50	Gen. Elec.	KT342	900
2—	50	Whse. hislip	WL607	900
1—	40	G.E. hitorq	FTR532	1200
1—	40	Al. Ch. 3 speed	ARX	900/600/450
5—	40	Gen. Elec.	KT336	900
2—	40	G.E.	KT	1200
2—	35	Gen. Elec.	I-K	720
2—	30	Howell b.b. speed	SC	1800
2—	30	G.E. NEW b.b.	K365	1800
2—	30	G.E. NEW hitorq	KG365	1800
2—	30	Whse. NEW b.b.	CS405	1200
2—	30	G.E. TEFC b.b.	K404	1800
1—	30	Gen. Elec.	I-K	900
1—	30	Gen. Elec.	KT336	720
1—	30	Wagner	22T8P	900
1—	30	Whse.	CS646	900
2—	30	Reliance TEFC NEW	C444	1200
3—	30	Cr. Wheeler b.b.	SC 30Y	1800
2—	25	Rel. TEFC NEW	C444	900
5—	25	Reliance b.b. NEW	C364	1800
2—	25	Reliance TEFC NEW	B365	1800
2—	25	Reliance b.b. NEW	C404	1200
2—	25	Reliance TEFC NEW	C405	1200
2—	25	Whse. NEW spl. b.b.	CS365	1800
1—	25	Gen. Elec.	IK	1200
3—	25	Whse.	CS646	900
2—	25	Gen. Elec.	I-K	600
1—	20	G.E. TEFC b.b.	K404	1200
1—	20	U.S. NEW b.b.	SC326	3600
1—	20	Gen. Elec.	KT182	3600
4—	20	Reliance b.b. NEW	C364	1800
2—	20	L.A. NEW exp. prf.	EX364	1800
2—	20	Whse. NEW b.b. spl.	CS364	1800
2—	20	Gen. Elec.	KT312	1200
2—	20	Gen. Elec.	I-K	1200
1—	20	Whse.	CS	1200
1—	20	Gen. Elec. b.b.	I-K	900
2—	20	G.E. NEW b.b.	K365	1200
2—	20	Diehl TEFC NEW	1NF364	1800
2—	20	Century b.b. 4 speed	SC594	1800
2—	15	Whse. Splashprf.	C3365	1200
4—	15	G.E. NEW b.b.	K324	3600
2—	15	Whse. NEW TEFC	CS326	1800
1—	15	Diehl TEFC NEW	INF365	1200
4—	15	Gen. Elec.	KT302	1200
1—	15	Gen. Elec.	KT512	900
1—	15	L. Allis	OX365	900

ARTHUR WAGNER COMPANY

1436-38 W. RANDOLPH STREET CHICAGO 7, ILL. MONroe 7409

1250-KVA Diesel Engine-A. C. Generator Sets-Complete with Switchgear, Shaft Exciter Etc



FAIRBANKS-MORSE 1600-HP. Model 38D8 ⅛, OPCyldrs. 720-RPM. Diesel Engines Connected to NEW (Unused) Crocker-Wheeler 1250-KVA. Generators, Complete Units.
SEVERAL IN STOCK: IMMEDIATE DELIVERY: WRITE FOR DRAWINGS, PRICES
WE SPECIALIZE IN DIESEL-GENERATOR SETS: Send us your Specifications
Several Nordbergs: 1250-HP., G.E., West. Generators: 600-HP. Fairbanks-Morse Diesel-Generator Set. 400-KW. Generator.
4—600-HP. COOPER-BESSEMER DIESEL ENGINES.
Always secure Weaver & Co.'s Prices: Are Money Savers

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WE OWN OUTRIGHT AND CARRY ONE OF THE LARGEST STOCKS IN THE USA
STOCK IS TOO LARGE TO ITEMIZE HERE:
SEND US CAPACITY, STEAM PRESSURE, VOLTAGE: We will do the rest.

CONDENSERS NEW AND NEW AUXILIARIES: BEST MAKES: LATEST DESIGNS
FOR IMMEDIATE DELIVERY

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NEW—5000-KVA., G.E., 600#-psi., 750° FTT.
Aut. Extra. Non-condg. New 1075-KVA. 450#
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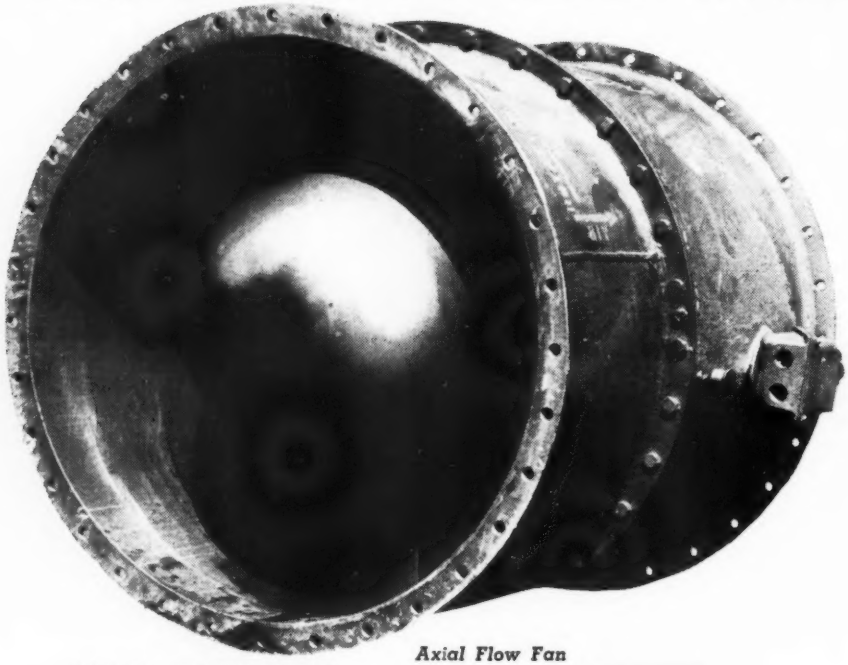

Axial Flow Fan

AXIAL FLOW FANS

12,000 CFM, 1" S.P. 3/60/450 motors
10,000 CFM, 3" S.P. 3/60/450 motors
5,000 CFM, 3" S.P. 3/60/450 motors
35,000 CFM, 3" S.P. 230V D.C. motors

Rugged construction, acid resisting vanes, totally enclosed motors, all NEW

HOISTS

10—100,000# pull at 10 FPM to 3000# pull at 400 FPM, 2 Gypsies 12000# pull at 125 FPM, driven by 50 HP 230v. D.C. motors 525—1800 RPM.

15—15,000# pull at 78 FPM, 3360# pull at 348 FPM and 2 auxiliary drums. Driven by Chrysler 28.35 H.P. gasoline engines. (NEW).

HYDRAULIC PUMPS

5—Vertical, quintuplex, 4⅝ x 10, 450 gpm at 128 RPM against 2500 p. s. i., mid. by Aldrich driven by 700 HP synchr. motors 3/60/2300.

BOILERS

10—Cleaver-Brooks, 2000# steam pr. hr. 35# press.

6—Cyclotherm 3000 pounds steam per hour, 125# press.

6—Express Boilers, modified D type, Foster Wheeler 30,000# steam/hr., 435# press., with economizers, superheaters, desuperheaters, oil burners, etc.

8—B&W, D type, 580# press., 5400 sq.ft. heating surface.

CONDENSERS—ALL NEW

1—8533 sq. ft.
2—1050 sq. ft.
10—3800 sq. ft.
10— 400 sq. ft.
3—3300 sq. ft.
8— 155 sq. ft.
10— 206 sq. ft.—H.P. feed heaters

WIRE ROPE SLINGS

⅝" to 2½" various lengths
Also: Steel blocks, treble, 18" Sheave, capacity 15 ts and 30 ts.

DISTILLING PLANTS

2—40,000 gallons per day, Foster Wheeler triple effect low pressure.
1—80 tons per day. Condenser Service, double effect.
10—2000 gals. per day Kleinschmidt vapor compression distiller mfd. by Badger.
1—750 gals. per day, same as above.

MOTORS

3 Ph. 60 Cy.

6—3800 HP 1700 V 257 RPM G.E.
5— 700 HP 2300 V 128 RPM

D.C.

1500 HP 525 V DC 600 RPM W'hse.
667 HP 374 V DC 1300 RPM Elliott
444 HP 250 V DC 900 RPM Elliott
222 HP 230 V DC 3050 RPM W'hse.

GENERATORS

1200 KW 525 V DC 750 RPM All. Chalm.
1075 KW 375 V DC 750 RPM Elliott
700 KW 240 V DC 500/720 Elliott
540 KW 240 V DC 1200 RPM West.
100 KW 120/240 1200 RPM Delco
2250 KW 1700 V AC 257 RPM G.E.
60 KW 115 V AC 1800 RPM G.E.

TURBO-GENERATORS—A.C.

2—750 KW GE, Type AT1, 3/60/450, 1200 RPM, cond., 265# steam press.
2—450 KW, Whse, 3/60/450, 1200 RPM, cond., 250# steam press.
3—300 KW G.E. type AT1 3/60/450, 1200 RPM cond., compl., with 40 KW exciters, condensers, switchboards.
2—250 KW G.E. type AT1 3/60/450, 1200 RPM, cond.
2—200 KW Westinghouse, 3/60/450, 1200 RPM cond. (NEW).
8—200 KW, G.E. type ATB 3/60/450, 1200 RPM cond. and non-cond.
2—132 KW G.E. type ATB 3/60/450, 1200 RPM, cond.

TURBO-GENERATORS—D.C.

KW	Volts	Winding	Speed	Type
3—400	120/240	Shunt.	1200	cond.
2—375	180/240	Shunt.	1200	non-cond.
12—150	120	Shunt.	1200	cond.
20— 60	120	Stab. Sh.	1800	cond.
3— 25	120	Stab. Sh.	1200	cond.

DIESEL ENGINES

	Make	Model	H.P.	R.P.M.	Cycle	Cylinders	Bore & Stroke	Year	Reverse Reduction Gear
4	General Motors	16-258S	1800	900	4	16	9½" × 12"	1943	2.41: fluid coupling
2	Hamilton	R.B. 99-D.A.	1600	700	2	9	9¼" × 13⅜"	1944	
8	Fairbanks Morse	38 D O/P	1600	720	2	10	8⅛" × 10"	1944	Reversible, Hydr clutch
8	General Motors	16-278A	1600	720	2	16	8¼" × 10½"	1944	
35	General Motors	12-567ATL	900	744	2	12	8½" × 10"	1942-44	Falk 2.5:1
2	General Motors	8-268A	500	1200	2	8	6½" × 7"	1943	2.54:1
2	Fairbanks Morse	38 O/P	300	1200	2	6	5" × 6"	1936	
4	Buda	6LD468	95	1850	4	6	4¼" × 5½"		Driving Fire Pumps 1000 gpm, 280 ft. head.

Ask For Our Complete 1948 CATALOG

DIESEL GENERATOR SETS—A.C.

									KW	Volts	Cycles	Exciter Phase	Exciter KW	Exciter Volt
3	General Motors	8-268A	350	1200	2	8	6½" × 7"	1943	200	440	60	3	40	120/240
2	General Motors	3-268A	150	1200	2	3	6½" × 7"	1943	100	440	60	3	20	120/240

DIESEL GENERATOR SETS—D.C.

7	General Motors	16-278A	1000	750	2	16	8¼" × 10½"	1943	1200	525	Allis Chalmers Type MHC 2290 AMPS
4	General Motors	12-278A	1200	750	2	12	8¼" × 10½"	1943	1200	240	Elliott
2	General Motors	8-268A	500	1200	2	8	6½" × 7"	1944	375	120/180/240	Westinghouse-
2	Superior	VDMB	215	600	4	5	6" × 12"		125	120/240	Westinghouse
80	Superior	GDB-8	150	1200	4	8	5½" × 7"	1942-44	100	120/240	Delco 3 wire stab. shunt 60° C rise-
4	General Motors	3-268A	150	1200	2	3	6½" × 7"	1943-44	100	120/240	Allis Chalmers 3 wire stab. shunt

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31 Nassau Street New York 5, N. Y.

Tel. REctor 2-1334

ARRANGE FOR INSPECTION

BOILER SPECIAL

NEW

NEVER ERECTED

600# PSI PRESSURE

140,000# STEAM DELIVERED PER HOUR

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STATIONARY TYPE

WATER TUBE BOILER

Built by
COMBUSTION ENGINEERING COMPANY, Inc.

Owned and For Sale by

CHARLES WEAVER & COMPANY

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PHONE COLLECT
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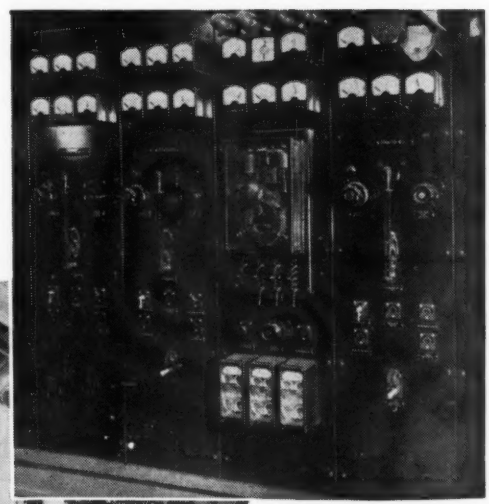
Electrical - Mechanical Engineers
4045 Penobscot Building
Detroit 26, Michigan

TELEPHONES:
CADILLAC 1340
CADILLAC 1341

2 Complete, Modern

575 KVA SKINNER UNAFLOW ENGINE GENERATOR UNITS



2— 750 HP Skinner unaflow engines, each directly connected to 575 KVA Westinghouse 220 volt, 3 phase, 60 cycle, 150 RPM alternating current generator, with

15 KW "V" belt-driven exciters

Complete switchboard control apparatus, with switchboard operated variable speed synchronizing devices and automatic voltage regulators.

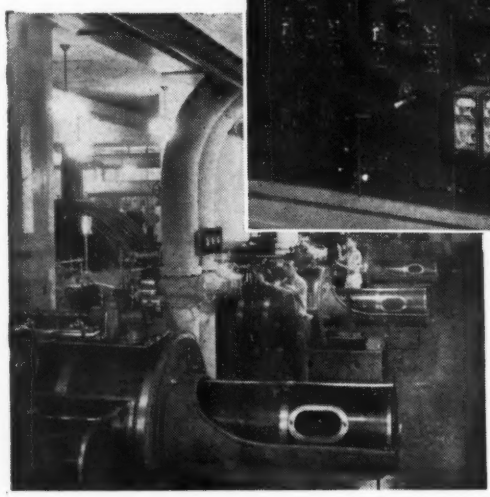
Also Available:

2— surface condensers with motor-driven circulating pumps.

2— 250 HP low pressure condensing steam turbines with auxiliaries.

This plant is one of the most modern medium-size steam power plants on the West Coast. It is complete in every detail.

The units were installed in 1935 and furnished complete power service for the building and presses of the Los Angeles Times. The plant has always been well maintained and is being removed from the Times Building now only because it is too small to furnish power for the building which is being enlarged to double capacity.



This complete steam power plant is offered for immediate shipment, F.O.B. Los Angeles. For further information write or telephone.

BEESON ENGINEERING CO.

1628 E. 7th Street • Los Angeles, 21, California

***Telephone* MUtual 9151**

POWER EQUIPMENT—READY TO SHIP

SAVE OVER 50% ON NEW INDUSTRIAL BLOWERS AND VENTILATING FANS

AXIAL FLOW VENTILATING FANS

5—50" dia. 7½" long, 2 sets of propellers, 8 blades to each. Dim: of blade, 14"x 9½" curved mfg'd by International. Size 114, driven by 100 HP., 1750 rpm., 220/440 v. 3 ph. 60 cy. A.C. Motor.

6—16000 CFM Buffalo Forge Co., 3" stat. pres. 1800/1200 rpm. con. 15/4.5 HP., 1710/1150 rpm., 3 ph. 60 cy. G.E. A.C. Motor 220/440 v. totally encl.

2—12000 CFM 3" stat. pres. Sturtevant with dir. con. 10/3 HP., 1775/1180 rpm., 220/440 v. West. CS. TEFC Motor.

1—7500 cfm Clarage with dir. con. 7½ hp., 1750 rpm., 3.3 HP. at 1160 rpm., 220/440 v. 3 ph. 60 cy.

31—6000 cfm Sturtevant Bulletin 512389, 3" stat. pres. 7 blade, dir. con. 5/1.5 HP., 1765/1175 rpm., 220/440 v. 3 ph. 60 cy. West. TEFC Motors.

2—5000 cfm Sturtevant 1.8 stat. pres. 4.2/1.25 HP., 1750/1150 rpm., 3 ph. 60 cy. 220/440 v. ball bearing motors.

2—4000 cfm 3" stat. pres. Sturtevant dir. con. 2 speed, TE Westinghouse 220/440 v. Motors.

A.C. MOTORS—3 PH. 60 CY.

No.	HP	Make	Type	RPM	Volts
1 new	500	Elec. Mach.	Syn	120	4000/2200 220/440
1	200	West.	CS	900	220/44
3 new	200	Elec. Mach.		1800	440
1	150	West.	syn.	450	220/440
1	150	West.	syn.	600	220/440
1	150	West.	syn.	900	220/440
2 new	150	Delco	syn.	1200	220/440
4	150	Louis Al.		1800	220/440
1	125	Elec. Mach.	syn.	164	220/440
1	125	West.	CS	680	2200/220/440
1	125	West.	CS	580	2200/220/440
1	100	Reliance		495	220/440
1	100	West.	CS	500	2200
3	100	Elec. Mach.	syn.	720	220/440
1	100	Allis Chal.		1200	220/440
5	100	Master	TEFC	1750	220/440
1	100	West.	CS	1750	220/440
1	75	Stanley		600	220/440
1	75	Elec. Mach.	syn.	900	220/440
1	60	G.E.	KT	1800	550/440/220
1	50	Wagner	(Fynn Weichel)	900	440/220
1	50	American		860	220/440
2	50	G.E.	K-405	1800	220/440

A. C. GENERATORS—3 ph. 60 cy.

1—450 Kva. Elec. Mach. 120 rpm., 4000/2200/220/440 v.

2—NEW 125 kva. Delco, 1200 rpm., 220/440 v.

2—115 kva. Elec. Mach. 720 rpm., 220/440 v.

1—100 kw. Elec. Mach. 164 rpm., 220/440 v.

1—100 kw., West. 900 rpm., 220/220/440 v.

1—100 kw., West. 600 rpm., 220/440 v.

4— 25 kw., O'Nan, 1800 rpm., 220/440 v.

D. C. GENERATORS—250 V.D.C.

3—250 kw., Westinghouse 1200 rpm.

2—200 kw., Reliance, 500 rpm.

8—100 kw., Reliance, 500 rpm.

1—100 kw., West., 720 rpm.

7—100 kw., Delco, 1200 rpm.

1—new 100 kw. Elliot 1200 rpm.

BARGAIN — FOR SALE
100 KW. DIESEL ENGINE GENERATOR SETS

11—100 KW., 120/240 V. D.C. Delco Generators dir. con. to 150 HP., Model GBD-8, 5½x7, 8 cyl. Superior Diesel Engines, elec. starting with muffler, power panel and accessories.

Practically as good as new—Only Used for Spares.

MOTOR GENERATOR SETS—250 V.D.C. 220/440/2200 V. A.C.—3 ph. 60 cy.

No.	KW	Make	RPM
1	250	West.	1200
2 new	100	Delco	1200
1	100	Elliott	1200
1	100	G.E.	900
1 new	100	Elliott	900
1	100	West.	600
1	100	West.	700
1	100	Reliance	580
2	90	West.	680
1	75	Elec. Machy.	720
1	75	West.	720
1	75	G.E.	720
2	50	West.	490
1	50	Cr. Wh.	900
3	40	G.E.	900
2	30	West.	900
1	30	West.	1750
3	10	West.	1750
1	5	G.E.	1750

VARIABLE SPEED MOTORS—230 V. D.C.

No	HP	Make	Type	RPM
2	200	Reliance	1970 T.	400/1200
1	200	West.	SK	400/1200
8	100	Reliance	1050T	400/1000
1	100	G.E.	RC-58	650/1200
2	100	West.	SK-183	575/1150
3	50	West.	SK-180	320/960
3	50	West.	SK	300/1200
1	40	Allis Chal.		400/1200
2	30	G.E.	DLC	400/1200
1	30	West.	SK-130	725/1450
1	30	G.E.	RA-32	800/1200
1	25	West.	SK-123	400/1600
1	25	West.	SK	500/1500
2 new	25	West.	SK-113	600/1200
1	20	West.	SK-110L	400/1600
1	20	West.	SK-123	400/1600

SLIP RING MOTORS—3 ph. 60 cy.

No.	HP	Make	RPM	Volts
2	800	West.	514	2200/6600
1	250	Allis Chal.	900	2200
1 new	200	G.E.	600	440
1	200	West.	1800	220/440
1	150	West.	1150	220/440/2200
1	100	Triumph	580	550/440/220
1	75	G.E.	720	220/440
1	75	G.E.	885	220/440
1	60	G.E.	720	220/440

SURFACE COMBUSTION GARDEN CITY HEAT TYPE EXHAUSTERS

3—#55 Single SSP, 14000 cfm at 1292 rpm., S.P. @ 70 deg. F and 8" water for 1200 deg. F. operation.

DYNAMOMETER

"Hi-Eff" hydraulic size 35#, model 58S, 3100 rpm., Taylor Mfg. Co.

SPECIAL BARGAIN AIR COMPRESSOR

6—240 CFM Westinghouse type 3 VS-23 3 cyl. vert., 150 lbs. pres. dir. con. to 50 HP., 220/440 or 2200 v. 3 ph. 60 cy. West Slip Ring Motors, auto. control. Can furnish D.C. Motors or Oil or Gasoline Engines if desired.

FREQUENCY CHANGERS

1—25 kw., 220/440 v. 3 ph. 180 cy., G.E. dir-con. to 25 HP., 1800 rpm., 220/440 v. 3 ph. 60 cy. motors.

SYNCHRONOUS MOTORS

1—New 500 HP., Elec. Machy. Co. 2200/220 or 440 v. 120 rpm.

ENGINE GENERATOR SETS

10—NEW 1 kw. 14.25 v. D.C. and 2 kw., 28.5 v. D.C. Homelite portable gas eng. Gen. sets. Can furnish lamps and batteries. Suitable for farms and camps.

3—5 kva. 120/240 v. 1 ph. 60 cy. Witte Diesel.

1—10 kw., 115 v. D.C. 1200 rpm., Hercules DIESEL.

30—NEW 25 kva. West. 120/208 v. 1 and 3 ph. 60 cy. LeRoi GAS.

1—35 kva. 220/440 v. 3 ph. 60 cy. 257 rpm., Ridgway STEAM.

1—125 kva. G.E. 220/440 v. 3 ph. 60 cy., dir. con. Skinner UNIFLOW Engine.

INDUCTION HEATING CONVERTER

New Van Norman, type indoor, floor, hi-freq. 32 kw. 220 v. 1 ph., 60 cy. 150 A. enclosed type.

WINCHES

240—Winch assembly portable engine hoists, swivel hook, 4¾" l, with 1½" opening and 30' of ¼" cable. Hand cranked, double reduction gear with drum 5¾" w. can be used with A.C. or D.C. Motors.

CAR PULLER or WINCH

1—Welen, 2 drum Winch or Car Puller rated 8600# per drum with 25 HP. G.E. Vertical Motor 230 v. D.C.

GEAR HEAD MOTOR

50 HP., G.E. 220/440 or 550 v., 3 ph. 60 cy., 1755 to 13 rpm., splash proof, ball bearing.

BRAND NEW TURBO SET

Westinghouse Steam Turbine consisting of 200 kw., 220/440 v., 3 ph. 60 cy. 1200 rpm., 80% P.F. A.C. Generator—40 kw., 120 v. 1200 rpm., D.C. Exciter and Westinghouse Reduction Gear. — Non-condensing.

SPECIAL ★ NEW A.C. MOTORS
Totally Enclosed— Fan Cooled
220/440 v. 3 ph. 60 cy.

No.	HP	Make	RPM
26	½	Dieh	1725
1	½	American exp. proof	860
10	¾	G.E.	1200
6	2	Louis Allis	1750
4	2	Louis Allis	1200
2	2	American	850
3	3	G.E.	1750
4	3	Allis Chal.	1150
7	5	G.E.	1750
25	5	G.E.	1150
1	7½	Louis Allis	1750
6	7½	G.E.	1200
6	10	G.E.	1750
3	10	G.E. vertical	1750
7	10	G.E.	1150
3	20	Louis Allis	900
1	50	G.E.	1750
2	75	Louis Allis	1150
5	100	Master	1750

PORTABLE COMPRESSOR

1—315 CFM Ingersoll Rand portable 100 lb. pres. driven by 105 HP Waukesha Oil Engines, 860 rpm.

FOR SALE OR RENT

WRITE, WIRE OR PHONE YOUR ELECTRIC NEEDS—SEND FOR STOCK LIST. LIST YOUR IDLE EQUIPMENT WITH US

Duquesne Electric & Mfg. Co. Pittsburgh 6, Pa.

BIG VALUES IN SURPLUS

"TRANSTATS"

Amertran Voltage Regulator

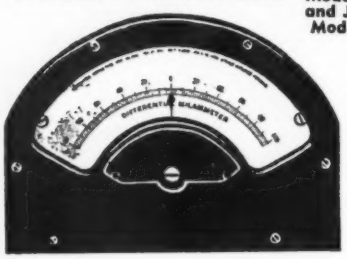
$75

11.5 KVA: 50/60 cy. Commutator Range 0-115 V. Max. Amp. 100. Can be reconnected for 230 volts @ 50 Amps.

BRAND NEW

MILLIAMMETERS

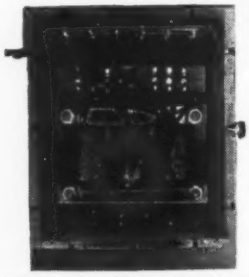
Weston Model 264 and Jewell Model 52



Designed for use as balance indicators on telephone and telegraph circuits, but are equally as well suited for DC armature testing. Will determine IR drop and polarity on commutator testing. Range 150-0-150 M.A.D.C. Scale length 4½". Accuracy within ½ of 1%.

Used But Good Condition OUR BARGAIN OFFER $2.50

G. E. Motor Starting Reactors



Type 11K2840G2

Rated at 440 Volts, 3 Phase, 60 Cycles, 16.8 Amperes. 15-20 HP. Waterproof Steel case. 17" x 15" x 10". Brand New in original factory cases.

$9.90

General Electric Type IRT 3 PHASE INDUCTION VOLTAGE REGULATOR

1.64 KVA. Outdoor service, filled with 9 gallons oil. Primary Volts: 208; Load Amperes—10.5. Brand New and in original manufacturer's cases.

PRICE $83.50

Sherwin-Williams Ajax Air-Drying INSULATING VARNISH

Large quantity in stock. Soluble in benzene. Cans are rusty otherwise varnish is guaranteed perfect. 5 gallon can... **$3**

MOTOR GENERATORS

Built by Allis Chalmers to U. S. Navy Specifications

Input: 115 Volts, DC at 14 amperes. 3600 speed, ball bearings. Output: 1.25 KVA; 80% P.F.; 120 Volts. 10.4 Amperes. With resistive control of voltage output and frequency built-in and with Centrifugal automatic controller built-in, permitting line-start operation. Fully enclosed, Splashproof. Brand New in Original Factory Cases. **$100**

Same machine for 230 Volts, DC operation. **$120**

Spare parts kit of brushes, brushholders, ball bearings, field coils, etc. in steel case, Price $10.

WATTMETERS, Westinghouse Type CS, 240V/60cy/1ph 15 Amp., 3 Wire, new **$12.50**
WATTMETERS, Westinghouse Type CS, 120V/60cy/1ph 15 Amp., 2 Wire, new **$9.50**
WATTMETERS, Westinghouse Type CA, 120V/60cy/1ph 15 Amp., 2 Wire, new **$9.50**

MOTORS

Allis Chalmers Motors; 30 HP; 550V-3ph-60cy 1750 RPM; Frame 573.....**Price $100**

General Electric Vertical Motors; like new, Model 5KF6304B51 Frame Type KF; 440-3-60 40 HP; 1760 RPM.....**Price $111**

General Electric Motors; Type B288; 6¾ HP; no base; flange mounting; 230 Volts, D.C.; Fields separately excited at 110 Volts. 1100 Speed; Ball Bearings. Brand New in original factory cases. **Price $64.50**

Electric Specialty Motors; Type BF51B; Marine Duty; Double Shaft, Ball Bearings; 2½ HP—5 Min. 440-3-60. Brand New in original factory cases .....**Price $23.50**

General Electric Motors, 1/6 HP, Type BC, 115 VDC, 1725 RPM Compound Wound. Reconditioned, guaranteed perfect.....**Price $9.50**

TRANSFORMERS

West. Dist. Trans: Brand New complete with oil. Type CSP 2400/4160Y Volts to 120/240.
7½ KVA $100
3 KVA $50
1½ KVA $37.50

Pennsylvania Air-Cooled Transformers. 10 KVA; Two insulated windings. 220/110 Volts. Brand New. A remarkable value at.....$65

Westinghouse Air-Cooled Transformers—460/230-230/115 volts, 1½ KVA, Type JR. Brand New $21.90

Westinghouse Transformers—460/230-230/115 volts, 1 KVA, Air Cooled, Type JR. Brand New...$17

CONTINENTAL MOTOR GENERATOR SETS

7½ KVA; 1800 Speed, Ball Bearings. Input: 230 Volts, DC. Output: 115 Volts, AC, single phase, 60 cycles. Complete with automatic controller, field rheostat and push button station.

Rebuilt—same as new. **PRICE $490**

General Electric Automatic COMPENSATOR

Type CR7051-H1A; Cat. 4386997G8, 2200 Volts, 3 Phase, 60 Cycles; 75 H.P.; Control Voltage: 220.

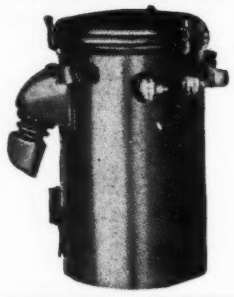
Condition Like New **PRICE $365.**

General Electric Glyptol

In glass jars and cans containing one gallon. Black per gallon..... **$4**

General Electric, Oil Filled OUTDOOR TRANSFORMERS

BRAND NEW



3 KVA; TYPE HS; 3000/5200Y-115/230 STYLE 3266596-G1; IN ORIGINAL FACTORY CASES

$36.

INVERTERS

Electronic Laboratories Inverters; Type 262; 250 watts, maximum; 110 volts, DC, input to deliver 110 Volts, AC, 60 cycles. Brand New but shop-worn—repainted. Guaranteed perfect. **Price $26.50**

ART Inverters: 6 Volts DC to deliver 110 Volts, AC; 85 watts, maximum. Brand new..... **Price $14.50**

ATR Inverters; 6 Volts DC to deliver 110 Volts, AC; 85 watts maximum. Brand New..... **Price $17.00**

Cotrell System PRECIPITATOR

Unit consists of very large screen for roof mounting and General Electric Transformer designated as "Substation Transformer" 13,200 Volts, 3 phase, 60 cy. Sec. 110/220V, 75 KVA, original cost $7,000.

Like New **PRICE $775.**

DUST COLLECTORS

These machines, manufactured by the Torit Mfg. Co. of St. Paul, Minn., are used for extraction of any dust from the air. They consist of a suction blower driven by a GE 1½ HP Motor; Type K; 220/440-3-60, 3475 RPM. and the entire unit is housed in a heavy steel case with louvres for dust intake.

PRICE $100.

An Outstanding Value
List price $3000—Our price $475
WESTINGHOUSE INDUCTION HEATER

450 KC, 10 KW, Radio Frequency Generator, 450 MC, 140 Amps. Input 220/440V 3 Ph. 60 cy. 48" W x 48" H x 30" D complete with following tubes: 1 WL-5604, 3 WL-872, 3 WL 678, 15W4. Watercooled. **USED BUT LOOKS LIKE NEW** **$475**

LARGEST STOCK OF AIR-COOLED TRANSFORMERS AND ELECTRICAL CONVERSION EQUIPMENT IN THE U. S. LET US QUOTE ON YOUR REQUIREMENTS.

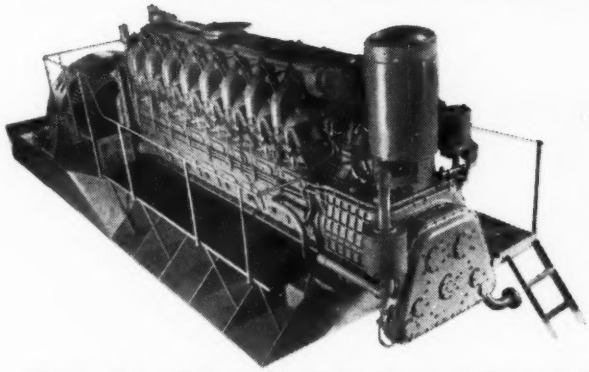
All prices F.O.B. Boston. Orders accepted from rated concerns on open accounts. Net 30 days.

Write for 112 Page Catalog on company letterhead

Electro Sales Company

Dept. P. 2. 110 Pearl Street, Boston 10, Mass.

DIESEL GENERATORS



1000 KW DIESEL GENERATING UNITS FOR QUICK DELIVERY

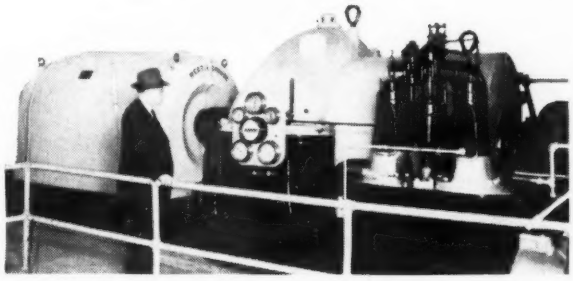
COMPLETELY RE-MANUFACTURED, 16 cyl., 1440 HP Gen. Motors 16-278A Engine dir. con. to NEW Electric Machinery Co. 1000 KW, 720 RPM, 80% PF, 3/60/2300 Generator. Complete with Air-starting Equipment, Heat-Exchange type Cooling, Switchgear Equipment and Base.

These Gen. Motors Diesel Engines are from U. S. Navy War Vessels built in 1942/44. Skilled mechanics rebuild them from top to bottom. All tolerances and wear-limits are expertly checked. NEW Gen. Motors replacement parts used wherever required. Can supply in other voltage and 50/60 cycles. We have other sizes. Ask us about them.

All units carry a one-year Guarantee.

Priced at about 1/2 of present newly manufactured Sets.

TURBO GENERATOR



JUST ONE AND ONLY ONE GOOD USED 3000 KW TURBO GENERATOR AVAILABLE

This is a Westinghouse, originally purchased from a U. S. Navy Power House. 200 psi, 100°F. Superheat, 3600 RPM, Ser. 6332 Turbine dir. con. to one 3000 KW, 3/60/2300, 80% PF, Westinghouse Generator. Inc. Rheostat, Condenser, Pump, Air Cooler, Exciter, Switch Gear, Ser. 2197695.

To Inspect it is to ***BUY*** *it!*

BOILERS

3 — 140,000#/hr. BRAND NEW COMBUSTION "VU" WATER TUBE BOILERS, EACH WITH SUPERHEATER, ECONOMIZER, FANS. COMPLETE. KNOCK-DOWN. 450 TO 600#. PROMPT DELIVERY.

1—125 HP Kewanee Economic Type, 125#, built 1942.
1—165 HP Keeler Cross Drum, 200#, Oil Burners, built 1935.
1—250 HP NEW Erie City Bent Tube, 2 Drum, 160#.
1—310 HP Keeler type "CP" Water Tube, with Stoker. Built 1942.
2—404 HP Springfield Sec. Hdr. Water Tube, Stoker. Built 1941.
2—480 HP Springfield Sec. Hdr. Water Tube, 100° Superheat, 250#.
1—508 HP Heine Bent Tube Water Tube, 4 Drum, 200#.
1—45,00#/hr. NEW Badenhausen, Bent Tube, 580#.

JTP

J. PARKER THOMPSON CO., INC.

Power Equipment

CABLE ADDRESS: "PARKTOM" NEW YORK
TELEPHONE: MURRAY HILL 7-6547

507 FIFTH AVENUE • NEW YORK 17, N. Y.

Reliably Rebuilt—YEAR Guarantee

A.C. Squirrel Gage Motors

H.P.	Make	Type	Speed
250	G.E. (2)	K-568	575
150	El. Prod.		1150
147	West.	CS-25 cy.	715
125	El. Prod.		1150
125	West.	CS	600
125	Al. Chal.	AR-630F	450
100	West.	CS-655C	1750
100	West.	CS-752S	1160
100	G.E. (2)	K-544	1175
100	West.	CS	870
100	G.E.	KT-556	865
100	West. (2)	CS	700
75	West.	CS-505S	1750
75	West.	CS-662C	1200
75	L.A.		1150
75	West.	CS	700
60	West.	CS-504S	1800
60	Rel. (2)		870
50	G.E.	FTR-523	3600
50	G.E. (2)	K-445	1150
50	G.E. (2)	XP	1800
50	L.A.	XP	1800
50	West.	CS	860

A.C. Clipring Motors

600	Cr. Wh.	25 cy.	480
100	Wagner	25 cy.	480
75	G.E.	IM	690
60	G.E.	TEFC	720
50	Al. Ch.	ARY	600
50	G.E. (2)		514
40	G.E.	IM	1200
40	G.E.	MT-352	600
30	West (2)	CI	900
30	G.E.	MT-542	720

A.C. Synchronous Motors

600	G.E.		900
400	G.E. (4)	TS	600
50	G.E.		1200

Generators

KW	Make	Speed
150	G.E.	600

D.C. to A.C. Gen.

KW	Make	D.C.	A.C.
25	G.E.	230	220
25	Star	115	120
25	Ideal	115	440
25	El. Mchy.	230	440
7½	Hertner	115	440
5	El. Spec.	110	110

230 V. Variable Speed D. C. Motors

H.P.	Make	Type	Speed
100	Rel.	1050T	400/1000
100	G.E.	CD173	400/1200
75	Cr. Wh.	CMC	375/750
60	G.E.	C	480/1100
55	Cr. Wh.	CMC	165/500
50	West.		250/1000
50	West.	SK	500/1500
40	G.E.	CD	500/1500
35	G.E.	RF	500/1500
25	G.E. (3)	RF12	500/1500
25	G.E.	RF13	400/1600
25	West.	SK140	400/1200
20	G.E. (2)	RF12	400/1200
15	West (3)	SK93	600/1750
15	West.	SK93	600/1200
15	E.D.	10S	500/1500
15	West.	SK	250/1500
10	G.E.	RF10	600/1800
10	West.	SK	600/1200
10	G.E.	RF	400/1600
10	G.E.	RF	400/1200

230 V. D.C. Motors

150	G.E.	RC19	800
100	G.E.	CDP	1750
100	Al. Ch.		900
75	West.	SK180	475
75	West.	SK170	635
60	West.	SK160	680
50	West.	SK133	1300
50	Diehl	K10	850
50	West.	SK	750
50	West. (3)	SK160	585
40	G.E.	RC	1750
40	West. (2)	SK103	1750
40	G.E.	RC	1075
35	West.	SK	1150
30	G.E.	RC	1100
30	West.	SK	975
30	G.E. (2)	RC	775
30	West. (2)	SK143	575
30	G.E. (2)	RC33	775
25	Rel.	92T	1150
25	West. (4)	SK113	860
25	E.D.	10S	800
20	West.	SK60	1750
20	West.	SK83	1750
20	G.E.	CD	1200
20	Star (2)	SHB30	29

115 V. D.C. Motors

H.P.	Make	Type	Speed
25	G.E.	CDM85	1800
25	G.E.	CDM95	1200
20	G.E.	CD83	1750
20	West.	SK110L	750

600 V. D.C. Generators

KW	Make	Speed
200	Cr. Wh.	900
3C	Burke	1750
30	E.D.	1150

250 V. D.C. Generators

KW	Make	Speed
330	Elliot	1200
500	West.	1100
300	G.E.	1200
200 (3)	G.E. MPC	1200
150	West.	900
150	West.	1180
150	G.E.	600
50	G.E.	1200
30 (3)	G.E.	1750
30	Cont.	1200
25	G.E.	1200
15	G.E.	1750
10	Star	1750
7½	West.	1200
5	West.	1750

125 V. D.C. Generators

KW	Make	Speed
250	G.E.	720
150	West.	900
150	Cr. Wh.	1200
100 (2)	West.	900
100	G.E.	1200
100	El. Mchy.	1200
75	Cr. Wh.	1200
75	Hertner	1150
50	Sturt.	2800
40	Cent.	1450
20	Delco	1200
15	G.E.	1150
10	Rogers	1450
7½	West.	1200
5	G.E.	1750

Low Voltage D.C. Generators

Amp.	Make	Voltage
8000	H-V-W.	6/12
6000	M-B-O'C. (2)	6/12
5000	M-B-O'C. (2)	6/12
5000	Col.	8/16
2000	H-V-W.	6/12
1000	Chandeysson	6/12
1000	Col.	6/12
125	Hobart (8)	7½
1000	H-V-W.	12/24
3000/1500	Chandysson	12/24
300	Star	15
67	Cont.	15
750	Star	15
1000	G.E.	15
800	G.E.	22/23
600	Rel.	24
134	West.	24
175	Cr. Wh.	25
550	Col.	27
1600	G.E.	30
800	G.E.	30
100	G.E.	30
200	West.	30
205	G.E.	32
1000	G.E.	33
205	G.E.	42
24	G.E.	44/54
75	G.E.	50/10
800	G.E.	50
1500	G.E.	50
400	G.E.	60
1500	Century	60
1500	El. Prod.	65
1000	G.E.	75

ONLY PARTIAL LIST—SEND FOR No. 15

EST. 1910 → L. J. LAND INC. ← 39TH YEAR

146 GRAND STREET, NEW YORK 13, N. Y.
PHONE: CAnal 6-6976

New England Representative:
BOSTON, MASS.
411 Atlantic Ave.
Phone: Liberty 4300

South Western Representative
HOUSTON, TEXAS, 1400 Carr St., Phone: Charter 4-6558

Pennsylvania Office
READING, PENNA.
10th & Exeter Sts.
Phone: Reading 2-6866

TURBO GENERATORS

1—500 K.W., 3 phase, 60 cycle, General Electric non-condensing.
500 KW., 3 phase, 60 cycle, 440 volt Gen. Elec. #39937 with surface condenser, evactor, and switchboard.
750 KW. Gen. Elec., 150 lbs. steam, 10-20 lbs. extraction.

MOTOR GENERATORS

100 KW., 125 volt Gen. Elec. to a 150 HP., 3 phase motor.
80 KW., 80 volt Burke with synch. motor and panels.
50 KW., 250 volt Westgh. to 3 phase synch. motor.

TRANSFORMERS

2—500 KVA, Pittsburgh, 33000 x 13200/6600.
3—400 KVA, General Electric, 13200 x 120/240.
2—150 KVA. Pittsburgh 2300 x 230/460 volt.
2—150 KVA. Pittsburgh 2400 x 120-240 volt.
Over 100 NEW Gen. Elec. up to 75 KVA., 450 x 120 volt.

DC ENGINE GENERATOR

150 KW., 125 volt Crocker Wheeler to a 4 cylinder vertical Ames engine.

MOTORS

Large stock AC & DC motors

CAPACITORS

50—15 KVA, 220 volt, 3 phase, new, General Electric

A. C. GENERATORS TO GASOLINE ENGINES

3—25 KVA, 120 volt, 1 phase, 60 cycle, 900 rpm, Westinghouse, with exciters to LeRoi Gasoline engines with panels, etc.

All above equipment actually in stock. Send for our list of many other items we have.

KEYSTONE
Power Plant Equipment Company

8403 Hegerman St. **Phila. 36, Pa.**

SYNCH. CONVERTER

300 KW G.E. 600 D.C. 1200 RPM. 6 PH. 60 CY. 2300/4000 V. TRANSFORMERS.

MOTOR GENERATORS

500 KW G.E. SYN. 250 V. 440/2300/4000 A.C. 900 RPM, 3 PH. 60 CY.

500 KW G.E. SYN. 600 V. 2300/4000 A.C. 900 RPM, 3 PH. 60 CY.

400 KW G.E. SYN. 250 V. 2300/4000 A.C. 900 RPM, 3 PH. 60 CY.

400 KW WEST. SYN. 600 V. 2300/4000 A.C. 720 RPM, 3 PH. 60 CY.

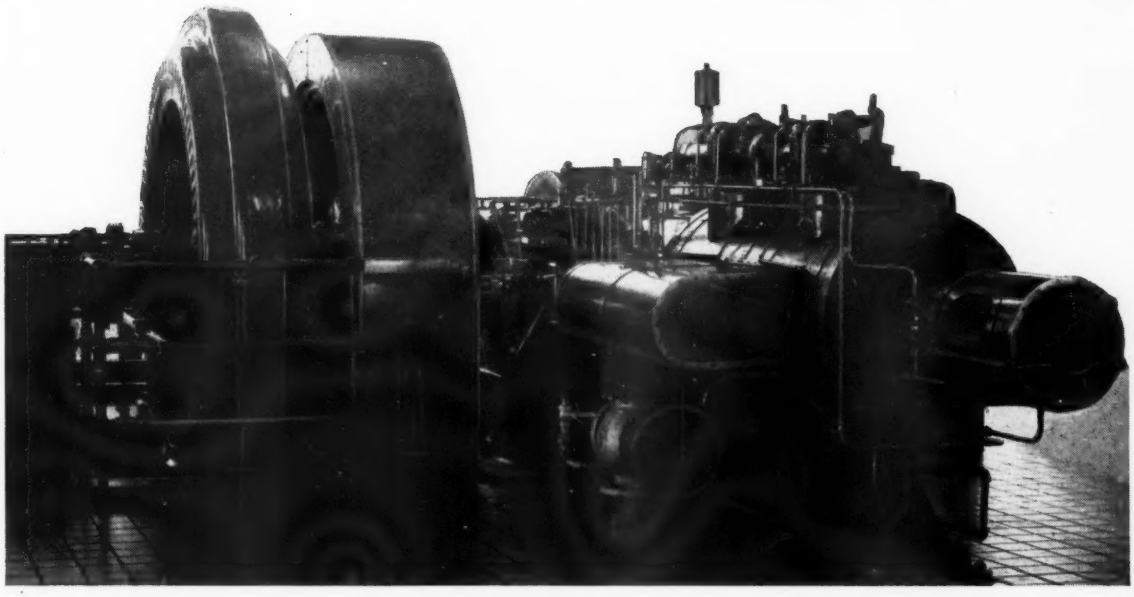
Each unit listed above is owned by us and is available now for immediate purchase.

WALLACE E. KIRK COMPANY

502 Grant Building, Pittsburgh, Pa.

FOR SALE

MODERN SKINNER UNIFLOW ENGINE GENERATOR UNITS



Actual Photograph

187½ KVA SKINNER UNIVERSAL UNIFLOW ENGINE GENERATOR UNIT

1—187½ KVA Crocker Wheeler generator 3 phase 60 cycle 460 volts direct connected to Skinner Universal Uniflow engine, 125-150# steam pressure, 0-5# back pressure, 200 RPM, with full floating piston.

2—250 KVA General Electric generators 3 phase 60 cycle 460 volts direct connected to Skinner Universal Uniflow engines, 125-150# steam pressure, 0-5# back pressure, 200 RPM, with full floating pistons.

1—500 KVA General Electric generator 3 phase 60 cycle 460 volts direct connected to Skinner Universal Uniflow engine, 125-150# steam pressure, 0-5# back pressure, 150 RPM, with full floating piston.

The above units are complete with switchboards, exciter sets and voltage regulator. They are in excellent condition and can be shown in operation.

You will note the generators are at present 460 volts. However, they can be reconnected for 230 volts.

Write or wire for details and prices.

INTERNATIONAL POWER MACHINERY CO.

UNION COMMERCE BLDG. Telephone: MAin 9514 CLEVELAND 14, OHIO

FOR SALE

Cochrane Open Type Feed Water Heater 38" sq. x 84" high. Fitted with all new trays. Approx. 750 H.P. 5000 Series.

VALVE & SUPPLY CO.
378 BEDFORD AVENUE
BROOKLYN 11, N. Y.

FOR SALE

350 H. P. Vogt Boiler

Dry Steam, Superheater, 8 years old. As good as new.

J. BRAVERMAN
53 Chester Ave. Coatesville, Pa.

FOR SALE

Power plant equipment. Steam, Diesel, electrical, boilers, engines, turbines, generators, new or used.

PENN MACHINERY COMPANY
Jackson, Miss.

TURBO GENERATORS

TURBINE OF THE MONTH

1—625 KW Westg., 150#, 5# B.P. non-condensing. 3 phase, 60 cycle, 2400 volts. Direct connected exciter.

1—2000 KW G.E. 6600v, 3 ph., 60 cy. with 175 lb. cond. turbine and dir. conn. exciter

1—1500 KW Whse. 480v, 3 ph., 60 cy. with 160/175 lbs. Surface Condenser, panel & exciter

1—450 KW Whse 250 lbs. I.S.P. Surface Condensers—Auxiliaries—3 phase, 60 Cycle, 440 Volts. Direct connected Exciter Equipment built 1944.

2—1250 KW G.E. 2300v, 3 ph. 60 cy. with 175 lbs. condensing turbine

1—1250 KW Al Ch. 2300v, 3 ph., 60 cy. with 200 lb. condensing turbine surface condenser

1—1000 KW G.E. 2300/4150v, 3 ph., 60 cy. with 135/150 lb. condensing turbine

1—500 KW G.E. 480v, 3 ph., 60 cy. dir. conn. exciter with 80/100 lbs. I.S.P. 10/15 lbs. B.P., non-condensing turbine

2—500 KW G.E. 2400 v, 3 ph., 60 cy. dir. conn. exciter, 175 lbs. I.S.P. 10/15 lbs. B.P. non-cond.

BELYEA COMPANY INC.

43 HOWELL ST. JERSEY CITY 6, N. J.

Phone—Journal Square 2-3334

ALSO N. Y. CITY LINE—RECTOR 2-7150

HEADQUARTERS for GEARMOTORS

Brand New G.E. and U.S. 3 Phase 60 Cycle 220/440 Gearmotors in Stock

Guaranteed for One Year

5—	½ HP	100 rpm	3—	3 HP	350 rpm
10—	¾ HP	100 rpm	1—	5 HP	68 rpm
9—	1 HP	84 rpm	3—	5 HP	100 rpm
5—	1 HP	230 rpm	10—	5 HP	230 rpm
5—	1½ HP	68 rpm	2—	7½ HP	100 rpm
15—	1½ HP	280 rpm	5—	7½ HP	420 rpm
8—	2 HP	37 rpm	2—10	HP	100 rpm
6—	2 HP	230 rpm	4—10	HP	280 rpm
7—	3 HP	45 rpm	1—15	HP	84 rpm
4—	3 HP	280 rpm	4—15	HP	350 rpm

Also New Speed Reducers from ½ HP to 20 HP and Rebuilt Gearmotors from ¼ HP to 25 HP in Stock at All Times

Ask for price list

Prompt Detailed Replies to All Inquiries

SANDMAN ELECTRIC COMPANY, Inc.

NEW ENGLAND'S LEADING MOTOR DEALER

166 Oliver St. • Boston 10, Mass.

These advertisements

are live opportunities in the Power field.

Each announcement represents a current Want or Offering of an organization or individual in the field, with some element of profit in each for whoever can fill the need. Some have money-saving possibilities, others are opportunities for more business; many are employment opportunities; still others offer property, or equipment—used or surplus new equipment.

"Searchlight" advertisements are constantly changing. New opportunities are constantly finding their way into this great Want medium, each issue. Regular reading of the "Searchlight" pages can be as important to you as reading the editorial sections; Editorial matter is news of the field; Advertising is NEWS OF OPPORTUNITIES offered in the field.

for EVERY business WANT

"Think SEARCHLIGHT first"

AVAILABLE
FOR IMMEDIATE DELIVERY

DESIRABLE

POWER PLANT EQUIPMENT

TURBO-GENERATORS
1—6000 KVA Westinghouse 2400 V surf. cond.
1—3750 KVA G.E. 480 V. cond.
1—2500 KVA Allis-Chalmers 2300 V cond.
1—1250 KVA G.E. 480 V mixed pressure

ENGINE GENERATORS
2—575 KVA Skinner Unaflow—direct connected to Westinghouse 240/480 V gen.
1—575 KVA Allis-Chalmers full releasing Corliss 480 V
1—375 KVA Ames vertical 220/440 V
1—275 KVA Ridgeway N.R.C. 2300 V
1—187 KVA Ames vertical
1—156 KVA Ames vertical 240 V

DIESEL ENGINES
General Motors, Fairbanks, Fulton, Nordberg and Buda from 15 to 1000 KW New and Rebuilt

ELECTRICAL EQUIPMENT
Large stock of Transformers, Motors, M.G. Sets, and Generators

WIRE—PHONE—WRITE
For Complete Specifications

LARGEST STOCK OF MODERN POWER PLANT EQUIPMENT ON THE PACIFIC COAST

BEESON ENGINEERING CO.
1628 E. 7th Street
Los Angeles 21, Cal.
Mutual 9151

NETWORK TRANSFORMERS

19—150 KVA, GE, type Ht. late type, oil or pyranol cooled, 3 ph., 60 cy., 27060/125/216Y Mult or submersible type; attached to each transformer is GE automatic heavy duty network protector type MG-6 and heavy duty primary switch; complete with all accessories.

8—200 KVA, GE, type Ht. late type, oil or pyranol cooled, 3 ph., 60 cy., 27060/125/216Y Mult or submersible type; attached to each transformer is GE automatic heavy duty network protector type MG-6 and heavy duty primary switch; complete with all accessories.

PHILA. TRANSFORMER CO.
2829 Cedar St. Phila., Pa.

1350 HP FAIRBANKS MORSE DIESEL PLANT

Consisting of 1-150, 1-300, 2-450 HP Model 32E late model units. Direct connected 2300 volt generators. Complete plant with all operating auxiliaries.

Immediate delivery.

Complete details on request.

MISSISSIPPI VALLEY EQUIPMENT CO.
507 Locust St. St. Louis 1, Mo.

APPLICATION ENGINEERS

45 KW M.G. Set 2200 AC 250 DC
100 KW M.G. Set 220/440 AC 125/250 DC
285 KW 240 volt Chuse Uniflow engine set
200 KW 480 volt Ridgway engine set
2500 KW 2300 volt G.E. Cond Turbine set
200 KW 1800 rpm 440 volt TEFC Motor

HOWARD B. JOHNSON & ASSOCIATES
53 W. Jackson Blvd. Chicago 4, Ill.

ELECTRICAL EQUIPMENT — REBUILT and GUARANTEED

MOTORS—GENERATORS—MG SETS—TRANSFORMERS—CONTROLS

LARGE STOCK OF A.C. and D.C. MOTORS

SLIP RING MOTORS—3 Ph., 60 Cy.

Qn	H.P.	Speed	Volts	Make	Type
6	7½	810	550	G.E.	MTC-5201
1	7½	575	220	G.E.	MT-522
2	10	1149	440	West.	HF-7A
2	10	570	220	G.E.	HI-11
2	11‡	810	550	G.E.	ITC-5008
2	15	1160	440	West.	CW-464C
2	15	570	220	West.	CW-646
1	18	680	440	West.	NW-316
1	20	860	440	West.	CW-638
1	25	1130	550	G.E.	MT-323
2	25	850	220	Wagner	BR
2	25	720	440	Wagner	22VBR
1	30	865	440	West.	CW-646
1	30	850	440	G.E.	MT-332
1	30	675	440	G.E.	MT-336
2	35	600	440	F-M	HV-H16A
2	40	865	2200	Al.-Ch.	ABY-223C
1	40	560	440	G.E.	MT-346
2	50	1150	440	G.E.	M-536
1	50	869	440	West.	HF-12A
5	52‡	550	220	G.E.	IQC-5013***
1	60	685	440	West.	CW-758
1	0	570	550	G.E.	MTC-5546
1	0	345	550	West.	CW
1	75	720	550	G.E.	MT-556
1	80‡	575	440	G.E.	MTC-5352
2	125	430	440	G.E.	IL-16
2	150	1750	440	G.E.	MTP-549
1	175	505	550	West.	CW-1002
2	200	600	550	G.E.	IM-17
1	200	495	2200	G.E.	IM-17A
3	250**	296	220/ 380††	West	CW-20-53-15
3	300	900	140	G.E.	IM-17
2	300	880	2200	G.E.	IM-17A
1	300	514	550	G.E.	IM-17A
2	300**	360	440	West.	CW-20-53-15
2	350	880	2200	G.E.	IM-17A
1	400	505	550	West.	CW
1	650**	360	440	G.E.	MT-442Y
1	700	735	4000‡‡	West.	CW

All 220 volt motors can be reconnected for 440 volts and vice versa.
‡ Intermittent rating. *** 2 phase.
** New. †† 50 Cycle. ‡‡ 25 Cycle.

230 Volt Constant Speed D.C. Motors

Qn.	H.P.	Speed	Make	Type
22	2	850	West.	SK-20
20	3	1150	West.	SK-20
10	3	850	Reliance	Y-23T
25	3½	850	West.	SK-30
3	7½	1750/1310	West.	SK-43
2	7½	1150	G.E.	CDM-66
3	7½	850	G.E.	CD-75
10	10**	1750	Kimble	BA-324
5	10**	1150	Al.-Ch.	EB-80
1	10	850	West.	SK-83
10	13½**	600	West.	SK-93
3	15	1750	G.E.	CD-75
5	15	825	West.	SK-90
1	20**	3500	G.E.	CD-75
1	20	1750	L.A.	ONA-L851
1	20	1750/1310	West.	SK-83
2	20	1150	G.E.	RC-30
11	20	750	West.	SK-1101
17	25	825	West.	SK-120
1	30	750	G.E.	RC
1	40	1700	West.	SK-103
1	40	750	G.E.	RC-34
1	50	750	West.	SK-150
1	50	650	G.E.	RC-16
2	60	1750–1310	West.	SK-143
3	75	850	West.	SK-160
1	150	700	Al.-Ch.	
2	200	1150	G.E.	RC-38
1	250	1150	C.W.	CMC-101A

230 VOLT ADJ. SPEED D.C. MOTORS

10	1½/2	500/200	G.E.	CD-65
1	2	225/900	Reliance	78T
1	5	450/1800	G.E.	CD-83
2	6	450/1800	G.E.	RF-9
6	5/7½	600/1800	G.E.	RA-30
1	10	400/1600	Reliance	T-92T
1	12½	280/840	West.	SK-130
10	12½**	600	West.	SK-93
1	15	600/1200	West.	SK-100L
1	20	500/1500	G.E.	RF-11
1	20/25	300/1200	West.	SK-153
1	25	500/1500	G.E.	RF-12
1	23/29	300/1200	G.E.	RF-13
1	30	400/1200	West.	SK-163
1	30/40**	400/1600	G.E.	CD-1236
1	35	500/1500	West.	SK-143
1	40/50	400/1600	Al.-Ch.	ED-147
1	75	500/1500	Cr.-Wh.	CCM
1	75	375/750	Cr.-Wh.	CMC-125H
3	100	225/900	G.E.	MPC-A
5	100	400/1200	Al.-Ch.	
1	100	320/960	West.	SK-200
1	175	230/750	West.	SK-220
2	375	350/500	G.E.	MPC

** New.

VARIABLE VOLTAGE DRIVES

40 HP. Reliance, Variable Voltage Drives, each Consisting of:
1—40 KW. 250 Volt, Induction M-G Set, with two auxiliary 5 KW generators and exciter.
1—40 HP 400/1500 RPM, Frame 385T, 230 Volt, DC Motor.
With full magnetic control providing jog forward, jog reverse, run, fast, slow, and stop, and motor operated field rheostat.

SQUIRREL CAGE MOTORS—3 Ph., 60 Cy.
Totally Enclosed Fan Cooled, Ball Bearing

Qn.	H.P.	RPM	Volts	Make	Type & Frame
2	½	1750	220	R&M (TE)	L-184
1	½	1725	440	G.E.	K-63
4	1	1140	220	Howell	A-204
4	1.5	1150	220	L.A. (TE)	IS-225
5	1.5	1140	440	West.	CS-225
1	2	1735	220	G.E.	K-224
4	2	1140	220	L.A.	JS-225Y
1	2	1100	440	West.	CS-225
1	3	3450	220	Howell	K-224
3	3	1160	440	L.A.	JS-254
1	5	3480	220	G.E.	K-225
2	5	1750	440	L.A.	JA-254
10	5	1730	440	G.E.	K-254
1	5	1720	440	Century	SCH-254
2	5	1165	440	L.A.	JA-284
5	7.5	1740	440	G.E.	K-284
1	7.5	1735	220	G.E.	KF-284
1	10	3480	440	West.	CS-324
1	10	1140	440	Wagner	CP2-326
1	10**	880	220	West.	CS-365-EXPF
1	15	1745	440	West.	CS-326
1	15	1175	440	L.A.	JA-365
1	25	1170	220	L.A.	JX-405
1	25	705	440	West.	CS-W504

Splashproof, Ball Bearing

1	2	1735	440	G.E.	K-224
1	3	1160	440	L.A.	FS-254
23	5	1750	440	L.A.	FS-254
1	5	1735	220	G.E.	K-254
1	5	1160	440	L.A.	FX-284
1	10	3480	440	G.E.	K-284
1	15	1175	440	L.A.	JA-365
4	15	1150	440	L.A.	FX-365
3	30	3520	440	L.A.	FX-365S
3	40	1175	220	G.E.	K-445
3	50	1760	440	L.A.	FX-445A
5	50	1160	220	G.E.	K-504
1	125	1770	440	L.A.	FX-107SY
1	150	1775	440	L.A.	FX-116S
4	150	880	440	L.A.	FX-136S
1	150	700	440	G.E.	K-6335
1	200	885	440	L.A.	FS-137S

Open Type Motors

Qn.	H.P.	Speed	Volts	Make	Type
5	2	170	440	G.E.	KT-926
4	2	1160	440	West.	CS-93C
1	2	690	440	G.E.	KT-944
10	5	1740	440	West.	CS-232C
1	7½	3475	440	West.	CS
1	7½	1750	440	West.	CS-250C
3	7½	1165	440	G.E.	KT-952
2	7½	870	440	West.	CS-370C
5	10**	1760	440	L.A.	OGA-324
5	10**	1750	440	West.	CSP-324
3	10	1160	440	West.	CS-370C
1	10	865	440	G.E.	KT-502
1	15	3485	220	Reliance	AA-B3247
5	15**	1735	440	Century	SC326
1	15	1200	220	G.E.	KT-502
1	15	900	220	G.E.	FTR-512
1	20**	3475	220	West.	CS-326
5	20**	1750	440	Wagner	RPI-364
1	20	1750	220	West.	CS-W364
1	20	1200	220	G.E.	KF-512
2	20	900	220	G.E.	FTR-522
1	25	1800	220	G.E.	KT-312
5	25**	1740	440	Century	SC-364
1	25	1160	440	West.	CS-667C
1	25	900	220	Howell	SCRB-356***
2	25	575	440	G.E.	KT-542
1	30	1160	440	West.	CS-644
1	30	870	220	West.	CS-646
1	40**	3545	220	G.E.	KF-404S
3	40	1750	440	West.	CS-583C
2	40	900	2300	G.E.	FTR-536
4	50**	1750	440	Wagner	RP5-405
1	50	850	220	West.	CCL
2	60**	1750	440	Ideal	AH-444
2	60	900	440	G.E.	KT-346
1	75	1160	440	West.	CS-662C
1	75	870	220	West.	CS-766A
1	100	690	220	West.	C
1	100	580	2200	G.E.	IK-15A
2	100	500	2200	West.	CS-930
1	100	495	2200	Al.-Ch.	AN
2	125	435	440	Al.-Ch.	AR
2	125	400	2300	G.E.	I-17-FR
2	200	580	550‡‡	G.E.	KT-566S
1	500	1200	440	G.E.	KTP-567
1	700	1800	2300/4000	West.	CS-4-39D-12

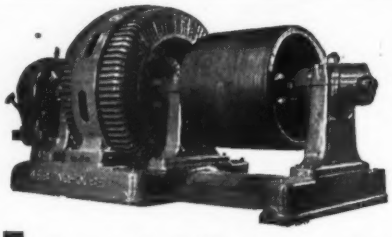
All 220 volt motors can be reconnected for 440 volts and vice versa.
** New. *** 2 Phase.
‡‡ Reconnectable for 440 volts.

CRANE, MILL TYPE 230 V. D.C. MOTORS

Qn.	H.P.	Speed	Make	Type
2 (115 v.)	3½	700	G.E.	CO-1803
2	5½	760	West.	MCB-20
1	6½	680	West.	K-3
1 (new)	10	650	G.E.	MD-403-BE
3	25	590	Diehl	TE
2	27½	535	West.	K-7
2	35	750	G.E.	CO-1828
3 (new)	35	600	West.	CK-9
1	50	750	G.E.	CO-1829A
1	50	600	West.	CK-9
5 (new)	50	525	G.E.	COM-1830AE
1	59	470	G.E.	CO-2007
2 (new)	69	550	G.E.	COM-1831 AE
4	65	450	G.E.	COM-1830

Above Items Represent a Partial Listing Only. Your Inquiries Will Receive Our Prompt Attention. All Equipment Is Located In Our Cleveland Warehouse. We Have Controls for Most Items Listed.

ELECTRIC GENERATOR & MOTOR CO.
4521 HAMILTON AVE. CLEVELAND 14, OHIO



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Fine Items From One of The Nation's Largest Stocks Of Motor Generator Sets Check These Units For Service, Economy and Prompt Delivery

Special Offering

MOTOR GENERATOR SETS

1000 KW generator, General Electric type MPC, compound interpole, 275 volts, 514 RPM, direct connected to, 1120 KVA synchronous motor, General Electric, type TS, 3 phase, 60 cycle, 4600 volt, 514 RPM, on fabricated steel sub-base. Complete.

500 KW generator General Electric, type MPC, compound interpole, 250 volts, 720 RPM, direct connected to, 710 HP synchronous motor, General Electric, Type ATI 3 phase, 60 cycle, 440 volts, 720 RPM, 3 bearing unit, on fab. steel sub-base.

TWO COMPLETE & VARIABLE VOLTAGE DRIVES

Motor Generator Set—

200 KW DC generator, General Electric, type MPC 250 volts, 800 amps, 1200 RPM, direct connected to, 300 HP synchronous motor, General Electric, type TS, 3 phase, 60 cycle, 440 volts, .8 P.F. 1200 RPM.

D.C. Motor—

250 HP General Electric, type MPC, form A, 245 volts, 730/975 RPM. Complete Starting and Control Panels.

MOTOR GENERATOR SETS

KW	Make	AC Volts	DC Volts
1500	Al. Chlrs.	4000	550/600
1000	Gen. Elec.	4150	600
500	Gen. Elec.	2300/4000	600
500	Gen. Elec.	440	250
450	Gen. Elec.	2300	125
400	Ideal—3 unit	2300	125/250
300	Gen. Elec.	440/2300	250
300	Gen. Elec.	2400	250
200	Cr. Whlr.	2300	125
150	Al. Chlrs.	220	125
90	Gen. Elec.	2300	60
75	Star	220/440	230
75	Gen. Elec.	2300	125
75	Wstghse.	2300	110
75	Gen. Elec.	2300	250
60	Al. Chlrs.	2300	110
60	F. Morse	220	125
50	Wstghse.	220	110
50	Cr. Whlr.	240	230
40	Cr. Whlr.	220	125
40	Wstghse.	220	125
40	Cr. Whlr.	440	125
40	Reliance	440	250
35	Gen. Elec.	220	40
25	Wotton	220	97/111
22	Wstghse.	440	125
15	Columbia	440	45
15	Wstghse.	220	250
10	Reliance	440	250
10	Cr. Whlr.	220	125
8	Hertner	220	90/108
7½	Milwaukee	44	60
6	Gen. Elec.	220	230
5.25	Wstghse.	220	115
5	Cr. Whlr.	220	115
5	Ideal	220	115/230
5	Hertner	220	90/108

SQUIRREL CAGE MOTORS

HP	Make	Type	Volts	Speed
700	Gen. Elec.	K	2200	1800
400	Wstghse.		2200	1750
350	Wstghse.	CS	440	900
350	Gen. Elec.	K	2200	1775
200	Gen. Elec.	KT	2200	575
200	Wstghse.	CS	440	1750

D. C. MOTORS

HP	Make	Type	Volts	Speed
100	Gen. Elec.	RC	220	2500
100	Wstghse.	SK	230	625
75	Wstghse.	SK	230	850
60	Gen. Elec.	CD	550	1000

SLIPRING MOTORS

HP	Make	Type	Volts	Speed
1200	Wstghse.	CW	2200	590
800	Wstghse.	CW	6600	507
750	Al. Chlrs.		4600	450
600	Gen. Elec.	I	6600	300
600	Gen. Elec.	IM	440	352
500	Gen. Elec.	IM	440	1800
500	Al. Chlrs.		2200	514
350	Gen. Elec.	IM	2200	720
300	Gen. Elec.	IM	440	900
300	Wstghse.	CW	440	360

SYNCHRONOUS MOTORS

HP	Make	Type	Volts	Speed
1250	Gen. Elec.		2200	900
1080	Wstghse.		6600	750
1000	Gen. Elec.	TS	2400	900
885	Gen. Elec.	ATI	11400	514
700	Wstghse.		440	900
500	Elec. Mach.		2200	514
500	Gen. Elec.	ATI	440	900
500	Elec. Mach.		2300/400	120

Remember! This Is Only A Partial Listing From Our Large Quality Stocks. We Can Furnish You With Any Item In the Electrical Power Equipment Field . . . . And Then Some

CHICAGO ELECTRIC COMPANY

1320 WEST CERMAK ROAD — CHICAGO 8, ILL. — CANAL 2900

POWER EQUIPMENT

NORTHERN METAL COMPANY — TOPS IN DEPENDABILITY

DIESEL ENGINES — DIESEL GENERATORS
TURBO GENERATORS

WE HAVE ON HAND ONE OF THE LARGEST INVENTORIES OF POWER EQUIPMENT IN THE EAST . . . . . .

MOTOR GENERATORS - STEAM ENG. GENERATORS - CENTRIFUGAL FANS - CENTRIFUGAL PUMPS
ROTARY PUMPS - RECIPROCATING PUMPS - MACHINE TOOLS - MOTORS A-C D-C - AIR COMPRESSORS

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TURBINE UNITS—60 Cy.

2—5625 KVA G.E. Cond. 25 Cy. 2300 Volts 1500 RPM 225-lb.
1—5000 KVA G.E. Cond. 2300/4000 Volts 1800 RPM 200-lb.
2—3750 KVA West. Cond. 2300 Volts 3600 RPM 150/200-lb.
1—3125 KVA West. Cond. 2300 Volts 3600 RPM 200-lb.
1—2000 KVA G.E. Cond. 6600 Volts 3600 RPM 200-lb.
1—1850 KVA G.E. Cond. 480 Volts 3600 RPM 150-lb.
2—1250 KVA G.E. Cond. 2300 Volts 3600 RPM 135-lb.
1—1250 KVA Al. Ch. Cond. 2300 Volts 3600 RPM 200-lb.
1—1250 KVA G.E. Non-C. 440 Volts 400-lb.
1— 625 KVA G.E. Non-C. 240 Volts 3600 RPM 170-lb.
1— 600 KVA Al. Ch. Cond. 480 Volts 3600 RPM 150-lb.

WATER TUBE BOILERS

1—2000 HP B. & W. 450-lb. Pul. coal & oil
1—1200 HP Comb. Engr. 600-lb. Pul. coal or oil
1— 519 HP Titusville 200-lb. Stoker
2— 509 HP B. & W. 200-lb. Stokers
1— 500 HP Union City 400-lb. Pulverizer
1— 418 HP Comb. Engr. 400-lb. Stoker
2— 406 HP Union Iron Wks. 200-lb.

STEAM ENGINE UNITS—60 Cy.

1—900 KW Hamilton Uniflow
1—450 KVA Ames Uniflow
1—400 KVA Murray Corliss
1—350 KW Allis Chalmers Corliss
2—250 KVA Skinner Uniflow
2—200 KW Skinner Uniflow
1—156 KVA Ames Vert. Uniflow
1—125 KVA Ames Uniflow

D.C. STEAM ENGINE UNITS

2—750 KW Skinner Uniflow 250 V.
1—300 KW Skinner Uniflow 275 V.
1—275 KW Ames Vertical Uniflow 250 V.
1—200 KW Skinner Uniflow 250 V.
1—200 KW Skinner Uniflow 125 V.
1—100 KW Skinner Uniflow 230 V. 3-wire
1— 75 KW Ames Uniflow 125 V.

DIESEL ENGINE UNITS

6—1600 HP Fair. Morse 60 cy. 2300 V. NEW gen.
1— 720 HP Amer. Loco. 240 V. DC
1— 625 HP Worth. 240 V. 60 cy. gen.
1— 450 HP Buckeye 450 V. 60 cy. gen.
1— 400 HP DeLaVergne 2400 V. 60 cy. gen.
1— 375 HP Worth. 240 V. 60 cy. gen.
2— 240 HP Fair. Morse 2400 V. 60 cy. gen.

SYNCHRONOUS MOTORS—60 Cy.

2—3000 HP G.E. 2300 V. 257 RPM
1— 880 HP G.E. 6600 V. 514 RPM
3— 400 HP Elec. Mcy. 440 V. 600 RPM
1— 300 HP G.E. 2300 V. 600 RPM
1— 300 HP West. 2300 V. 900 RPM
4— 150 HP West. 2200 V. 400 RPM
1— 100 HP G.E. 2300 V. 240 RPM (Super)

INDUCTION MOTORS

1—8000/1000 HP Cr. Wh. S/R 2200 V. FL 895/448 RPM
1—1200 HP Allis Chalmers S/R 2200 V. 440 RPM
3— 350 HP Elliott S/C 2300 V. 900 RPM
1— 300 HP West. S/R 2200 V. 1800 RPM
3— 200 HP Elec. Mcy. S/C 480 V. 1800 RPM
1— 200 HP G.E. S/R 2200 V. 435 RPM
1— 150 HP Cr. Wh. S/C 440 V. 1800 RPM. NEW
1— 150 HP Al. Ch. S/C 440 V. 1200 RPM
1— 60 HP West. S/C 2300 V. 1200 RPM

MOTOR GENERATOR SETS

1—1500 KW Al. Ch. 600 V. DC 60 cy.
2—1000 KW Gen. Elec. 600 V. DC 60 cy.
2— 500 KW Gen. Elec. 250 V. DC 60 cy.
1— 400 KW Al. Ch. 275 V. DC 25 cy.
2— 300 KW Al. Ch. 275 V. DC 25 Cy.
1— 250 KW Al. Ch. 275 V. DC 25 cy.
1— 200 KW Gen. Elec. 60 V. DC 60 cy.
1— 75 KW West. 125 V. DC 60 cy.
1— 75 KW Ridgway 115 V. DC 60 cy.
2— 75 KW Star 240 V. DC 60 cy.
1— 18 KW West. 60 V. DC 60 cy.

SYNCHRONOUS CONDENSER

1—500 KVA Westinghouse 3 ph. 60 cy. 2300 or 4600 or 1800 Volts 900 RPM

ROTARIES—60 Cy.

1—2929/3705 KW Gen. Elec. 225/285 V.
1—2025/2565 KW Gen. Elec. 225/285 V.
1—2000 KW Allis Chalmers 600 V.
1—1500 KW Westinghouse 600 V.
2—1500 KW Westinghouse 270 V.
2—1000 KW General Electric 600 V.
1—1000 KW Westinghouse 240 V.
1— 750 KW Westinghouse 275 V.
1— 750 KW General Electric 600 V.
1— 500 KW Allis Chalmers 600 V.
1— 500 KW General Electric 275 V.
2— 300 KW Westinghouse 250 V.

FREQUENCY CHANGERS

1—6250 KVA G.E. 50/60 cy. 600 RPM
1—2000 KW G.E. 25/60 cy. 300 RPM
1—1000 KW G.E. 25/60 cy. 300 RPM
2—1000 KVA G.E. 25/60 cy. 300 RPM
1— 500 KW G.E. 25/60 cy. 300 RPM

TRANSFORMERS—60 Cy.

4—7500 KVA Al. Ch. 33000-13800 V. 3 ph.
3—3750 KVA West. 26400/13200-2400 V.
1—8000 KVA Penn. Auto 26400-13200 V. 3 ph.
4— 333 KVA Al. Ch. 25410/44000-13280/23000Y
3— 75 KVA G.E. 33000-2300 V.
3— 50 KVA G.E. 33000-2300 V.
3— 750 KVA West. 22000-2300/4600 V.
6—3000 KVA Al. C. Furnace 13200-200 V.
2— 200 KVA G.E. 11500-220/110 V.
3— 150 KVA Moloney 11000-2300 V.
3— 167 KVA G.E. 7200/12400 Y - 240/480
1—1500 KVA West. Auto 4000-2300 V. 3 ph.
1—2500 KVA West. 2400-480 V. 3 ph.
1— 100 KVA G.E. 2300-575 V. 3 ph.
3— 250 KVA Al. Ch. 2300-460 V.
3— 20 KVA West. 2200-575/287½ V.
3— 7½ KVA G.E. 600-120/240 V.
4—27½ KVA G.E. 440-220/110 V.

OIL CIRCUIT BREAKERS

2— 800 A. 87 KV American BB	Outdoor
1— 400 A. 37 KV West. GII	Outdoor
2— 400 A. 25 KV G.E. FK0136	Outdoor
2—1000 A. 23 KV Kelman CB76	Outdoor
4— 600 A. 15 KV G.E. FHK0139BS	Outdoor

PARTIAL LIST—WE HAVE ALL CLASSES OF POWER EQUIPMENT

BREW, WOLTMAN & CO., INC.

50 Church Street New York City 7, New York

VACUUM PUMPS

3—L2 Nash Hytor—New—59 CFM 20" Vacuum
1—1½ Beach Russ—Used—Rebuilt

AIR COMPRESSORS REBUILT

2—12" x 10" Sullivan WG6
1—10" x 10" Sullivan WG6
1—3 HP Curtis 2-stage, Tank Mounted
1—3 HP I-R 2-stage, Tank Mounted

COMPLETE LINE NEW AIR COMPRESSORS

from ¼ HP to 300 HP

PUMPS

3—16" ALV Cameron—8000 GPM—65' Head

We buy complete plants or individual machines.

Write for complete stock list.

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CROCKER WHEELER MOTOR

300 HP, 230 Volts D.C., 500 RPM, Type CCM, Size 108DA, complete with Starting Control Panel.

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Special Offerings

TURBO-GENERATORS

1—3500 KW 2300 V. Cond
1—3000 KW 600 V. Cond
2—2500 KW 440 V. Cond
1—2500 KW 2300 V. Cond
1—2000 KW 600 V. Cond
1—1500 KW 2300 V. Cond
1—1500 KW 600 V. DC Cond
2—1250 KW 2300 V. Cond
2—1000 KW 480 V. Extrac.
1—1000 KW 2400 V. Cond
1— 750 KW 2300 V. Cond
1— 600 KW 240 V. Cond
1— 500 KW 600 V. DC Cond
1— 500 KW 480 V. Cond
1— 500 KW 480 V. Extrac.
1— 250 KW 2300 V. Cond
1— 150 KW 2400 V. N. C.
2— 125 KW 220 V. N. C.
1— 125 KW 600 V. Extrac.
1— 50 KW 220 V. N. C.

BOILERS

1—150,000# 450# New
1— 30,000# 400#
1— 30,000# 425#
1—1030 HP 225#
4— 500 HP 200#
2— 500 HP 175#
2— 500 HP 400#
2— 480 HP 225#
2— 400 HP 180#
1— 400 HP 200#
1— 300 HP 200#
2— 250 HP 160#
1— 175 HP 15#
3— 158 HP 150#

TRANSFORMERS

3—667 KVA —2300/460
3—500 KVA 11,000/460
3—500 KVA 13,800/575
3—200 KVA 600/220/110

ENGINE-GENERATORS

1—375 KW 2300 V. Uniflow
1—168 KW 600 V.
1—168 KW 220 V. Uniflow
1—150 KW 240 V.
1— 75 KW 240 V. Uniflow

AIR COMPRESSORS

1—6000 CFM 50# Motor
2—5600 CFM 50# Motor
1—1200 CFM 100# Motor
1— 700 CFM 100# Motor
1— 400 CFM 100# Steam
1—6000 CFM 5.1# New
1—5000 CFM 10# Rotor Type Syn. Motor 440 V.

BELTED GENERATORS

1—520 KW 360 RPM —550 V.
1—500 KW 225 RPM 550 V.
1—350 KW 300 RPM 550 V.
1—180 KW 600 RPM 550 V.

Write or wire for additional data and prints.

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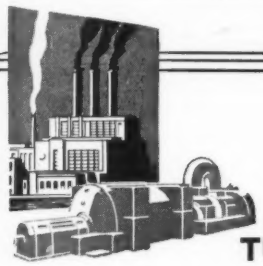
The Buyers Must Be Satisfied—Always



SPECIAL
TURBO GENERATOR
6000 KW
UNITY POWER FACTOR

OUTLINE DATA ISP 240#, 500° F total temperature, condensing. 60 cycle, 3 phase, 2400 volts. Surface condenser, panel board, meters, breakers, pumps, complete auxiliaries.
TURBINE Westinghouse semi-double flow, 6000 KW. Rebuilt 1922 by Westinghouse with steel parts for this rating and steam conditions indicated. Spring, 1948, complete overhaul. 1800 RPM. Originally manufactured 1912.
GENERATOR 6000 KVA. 2400 volts, 1443 amperes. April, 1948: Field removed, field and stator thoroughly cleaned and sprayed, generator overhauled. 50 KW shaft exciter.
CONDENSER 13,000 foot, Worthington surface condenser, with pumps, air ejector, etc. Radojet with inter condenser.
AUXILIARIES Complete and standby provided for most.

ITEM NO. 62 — **300 KW, 375 KVA Westinghouse TURBO Generator.** 1927. 150# condensing. 120/208 volts, 3 phase, 60 cycle, surface condenser. Rebuilt and rewound by Westinghouse 1941. Not used since.

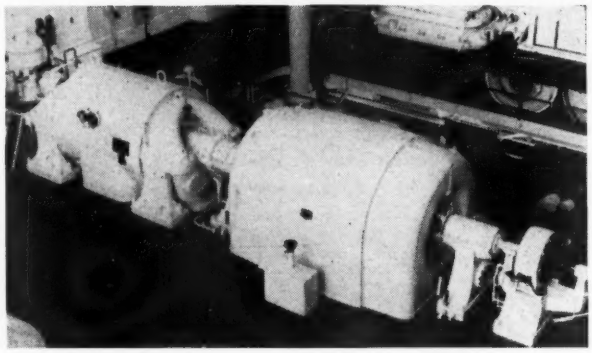
ITEM NO. 1494 — **1000 KW Turbine Plant, built 1928. 750 Kilowatt, 937 KVA Kerr-Allis TURBO GENERATOR,** 150# condensing, 480 volts, 3 phase, 60 cycle. **Plus duplicate unit for standby** with **One** 1500 foot surface condenser, auxiliaries.
200 Kilowatt, 250 KVA Kerr-Allis TURBO GENERATOR, 150# non-condensing, 10# G.B.P. Exciters, MG sets, switchgear, piping, crane.

ITEM NO. 1625 — **1000 KW, 1250 KVA Westinghouse TURBO GENERATOR.** 1933. 250#, 600° TT, condensing, 600 volts, 3 phase, 60 cycle. Surface condenser.

ITEM NO. 1638 — **1500 KW, 1875 KVA Westinghouse TURBO GENERATOR**—1924. 250#, 600° TT, condensing, 2400 volts, 3 phase, 60 cycle. Surface condenser, exciter, switchgear, etc.
Two 400 HP Box Header BOILERS. 260 psig, 125° SH, stoker fired—coal and ash handling, etc.

ITEM NO. 952 — **2000 KW Moore NON-CONDENSING TURBINE ONLY.** 1936. 185# ISP, 40# G.B.P. 3600 RPM. Condition excellent.

ITEM NO. 908 — **5000 KW, 6250 KVA General Electric TURBO GENERATOR.** 1920. 165# ISP. Condensing. Surface condenser. Just rebuilt, rewound.



ITEM NO. 910 — **600 Kilowatt Skinner UNAFLOW ENGINE GENERATOR.** 1927. 200#. 480 volts, 3 phase, 60 cycle.

ITEM NO. 941 — **260 HP Murray Box Header BOILER, 150# W. P. Built** 1930.

ITEM NO. 3 — **750 HP Union Iron Works, 3 drum, BOILER.** Built 1927. 250# W.P. Westinghouse stoker fired. New tubes.

ITEM NO. 1118 — **400 HP, 30,000#/hr. Springfield Sectional Header BOILER.** Built 1930. 375#, 675° TT. Oil and gas fired. Walkways, and gratings, fans, valves, fittings, etc. Ship in 10 days.

ITEM A — **Ten Combustion Engineering UNDERFEED STOKERS.** 1942 & later. Some new, different sizes.

ITEM B — **Two Fredericks RAM TYPE STOKERS. NEW.** 2400#/Hr. of coal.

ITEM C — **Two B & W, Type E, PULVERIZERS—Burners—4250#/Hr.** each.

ITEM No. 828 — **2500 KVA Davis DISTRIBUTION TRANSFORMER.** 1946. 2400 primary, 480 secondary. OISC. Outdoor.

ITEM NO. 1521 — **27,000 KVA total Westinghouse FURNACE TRANSFORMERS.** 1939. 13.2 KV primary. 160/240 secondary.

ITEM NO. 344 — **4000 KVA Pennsylvania FURNACE TRANSFORMER.** 1942. 22 KV primary. 90/260 secondary.

ITEM NO. 673 — **1000 KVA Kuhlman FURNACE TRANSFORMER.** 1935. 7200 volts primary. 90/214 secondary.

ITEM NO. 1415 — **Two 300 Kilowatt General Electric MOTOR GENERATOR SETS.** 250 volts D.C.; 2400 volts A.C. 1200 RPM. Rebuilt and guaranteed.

PAUL STEWART and COMPANY
UNION TRUST BUILDING • CINCINNATI, 2 OHIO

SUPPLIERS OF EVERY ELECTRICAL REQUIREMENT FOR INDUSTRY
REPRESENTING
ALLIS CHALMERS MOTORS • HOOVER MOTORS
EMERALD MOTORS • CUTLER HAMMER CONTROL
FALK COUPLINGS & MOTOREDUCERS

WE STOCK
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2. NEW & USED DC MOTORS
3. NEW & USED AC-DC CONTROLS
4. MOTOR GENERATOR SETS

WE FABRICATE TO ORDER
1. SPECIAL CONTROLS, PANELS AND CUBICLES
2. MOTOR GENERATOR SETS

AUTHORIZED ALLIS CHALMERS SERVICE SHOP
CERTIFIED SERVICE & REPAIR SHOP FOR OWENS-CORNING FIBERGLAS

SPECIALS IN STOCK
2—COMPLETE WARD-LEONARD VARIABLE VOLTAGE CALENDER DRIVES WITH MG SET, DC MOTOR AND ALL CONTROLS.
125 KW WITH A 200 HP 300/900 RPM SHUNT MOTOR
150 KW WITH A 135/175 HP 400/1200 RPM SHUNT MOTOR

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TRANSFORMERS
1—1500 KVA., 3 Phase, 60 Cy., General Electric, Type HT, Form D, 13200/12870/12540/12210/11880-2300 volts, #4679241.
4—75 KVA., Single Phase, 60 Cycle, General Electric, Type H, Form KR., 13200/12540/11880-440 volts, #4999501-03-05 & 07.
3—37½ KVA., Single Phase, 60 Cycle, General Electric, Type H., Form KG, 13800/13110/12420-230/115 volts, #5512044, 5512042 & 5514263.
3—25 KVA., Single Phase, 60 Cycle, General Electric, Type H, Form KR., 13800/13110/12420-230/460 volts, #4835052, 4790944 & 4835056.
All the above transformers are ready for immediate delivery.
ARCHER & BALDWIN, INC.
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75 West Street, New York City 6, N. Y.
Tel.—BOwling Green 9-9275-9276.

ASME BOILERS Nat'l Bd.
2—404 HP sectional steel header cross drum Springfield, 10' settings, oil fired.
2—25,000# (normal rating) Stirling's pulverizers, 425#.
2—400 HP sectional header, underfeed stokers.
1—300 12' settings, 7 years old, stack & breeching for these 3 units.
H. P. BREARLEY
3423-91st Street Jackson Heights, N. Y.

STEEL STORAGE TANKS
6—74,000 & 35,000 Bbl. Vertical
2—10,000 & 3—3,000 Bbl. Vertical
6—10,000 & 3—20,000 Gal. Horizontal
DARIEN CORP.,
60 E. 42nd St., N. Y., N Y

TRANSFORMERS
1 KVA up to 200 KVA in stock
ARROW TRANSFORMER CO., INC.
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Phone Ga. 5-0488

MOTORS • GENERATORS • TRANSFORMERS

MOTORS
3 PHASE—25 CYCLE—220 440 VOLTS

H.P.	Make	Type	Frame	RPM
50	Fairbanks Morse	H16B	Ball Bearing	750
75	Fairbanks Morse	H16C	B.B. Slipring	750
75	Gen. Elect.	IK	2200 volt	750
75	Gen. Elect.	IK		1500
100	Allis Chalmers			1450
150	Gen. Elect.	IK-17		365
150	Gen. Elect.	IK-16		480
150	Gen. Elect.	IM-16	Slip Ring	480
150	Allis Chalmers			1450
150	Gen. Elect.	KT	557	1455
400	Gen. Elect.	IM 17A	Slip Ring	730
500	Gen. Elect.	IK		485
600	Gen. Elect.	MT	Slip Ring	490
600	Westinghouse	CS		490

NEW TRANSFORMERS

3—75 KVA Niagara O.I.S.C. 2400/240/480 1 Phase 60 cycle with taps.
3—100 KVA Niagara O.I.S.C. 2400/240/480 1 Phase 60 cycle with taps.
3—100 KVA Niagara O.I.S.C. 2400/120/240 1 Phase 60 cycle with taps.
3—150 KVA Niagara O.I.S.C. 2400/240/480 1 Phase 60 cycle with taps.

REBUILT TRANSFORMERS

Qu.	KVA	Make	Cycle	Voltage
3	15	Wagner	25	4400/240/480
3	50	Pitts.	25	11000/2300
2	50	Kuhlman	25	11500/2300/230/460
1	50	Kuhlman	25	11500/115/230
2	50	G.E.	60	2400/120/2400
1	100	G.E.	25	4600/230/460
3	400	Pitts.	25	12000/110

FREQUENCY CHANGERS
All Sizes in Stock. 60 cycle to 90 cycle. 100 cycle, 120 cycle, 180 and any other high cycle if desired.

HORIZONTAL & DUPLEX
Compressor & Vacuum Pumps after Coolers, Filters

25 CYCLE MOTORS

1—1270 HP. Gen. Elect. Synchronous Motor Type A.T.I. 3/25/2200 Volts 150 RPM.
1—1900 HP. Gen. Elect. Synchronous Motor Type A.T.I. 3/25/2200 Volts 150 RPM.

MOTOR GENERATOR SETS

2—350 KW General Electric Sets 250 Volts D.C. driven by 500 HP. 3 Phase 25 Cycle motors.

ROTARY CONVERTERS

1—2000 KW Westinghouse Booster type Rotary Converter 230 Volt D.C.—3 to 6 Phase, 25 Cycle, 4600 Volt Transformer.
2—2500 KW. Gen. Elect. Synchronous Converters, 270 Volt DC.—Transformer 3 Phase, 25 cycle, 11,000 volts.
2—3500 KW. Gen. Elect. Synchronous Converters. 270 Volt DC.—Transformers 3 Phase, 25 cycle, 11,000 Volts.

COMPENSATORS

3—100 HP. Cutler Hammer Panel Mounted. Reduced Voltage Cat. #9141-H1387 3/60/2300 Volts.—New.
1—300 HP. Gen. Elect. Type CR 1034-K22. Reduced Voltage 3/60/440 Volts—Rebuilt.

NEW MOTORS
300 New Gen. Elect. & Westinghouse Motors in stock from 1 to 100 H.P.

75 KW. FREQUENCY CHANGER
75 KW. Gen. Electric Frequency Changer. 3 phase 120 Cycle 220/440 Volts—direct driven by 60 HP. Motor 3/60/220/440 volts.

MOTORS

1—75 HP. Fynn-Weischel Synn. 3/60/440/1200 RPM.
1—100 Gen. Elec. Slipring Type I Form M., 3/60/440/900 RPM.
1—100 HP. Gen. Elect. Type K (New Motor) 3/60/440/1800 RPM.
1—100 HP. Westinghouse Slipring Type CW, 3/60/440/435 RPM.
1—100 HP. Westinghouse Motor Type CS-867A, 3/60/440/885 RPM.
1—100 HP. West. Slipring Type CW 3/60/440/1200 RPM.
1—100 HP. Gen. Elect. Slipring 3/60/440/1200 RPM.
1—200 Gen. Elect. Type KT. 572 3/60/440/600 RPM.
1—200 HP. Gen. Elect. Slipring Type I Form M. 3/25/440/500 RPM.
1—500 HP. Allis Ch. Slipring 3/60/2200/514 RPM.
1—500 HP. Gen. Elect. Type I Form K, 3/25/440/485 RPM.
1—600 HP. West. Motor Type CS, 3/25/550/490 RPM.
1—600 HP. Gen. Elect. Slipring Type MT, 3/25/550/490 RPM.

VARIABLE SPEED MOTORS

2—300/150 HP. General Electric Motors Type BTA.—3 Phase 60 cycle 440 volts 560/280 RPM with controls.

3 PHASE 550 VOLTS 25 CYCLE MOTORS
Write for our stock list of approximately 500—3/25/550 Voltmotors

ERIE ELECTRIC CO., INC. 124 CHURCH ST. BUFFALO, N. Y. CL. 4758

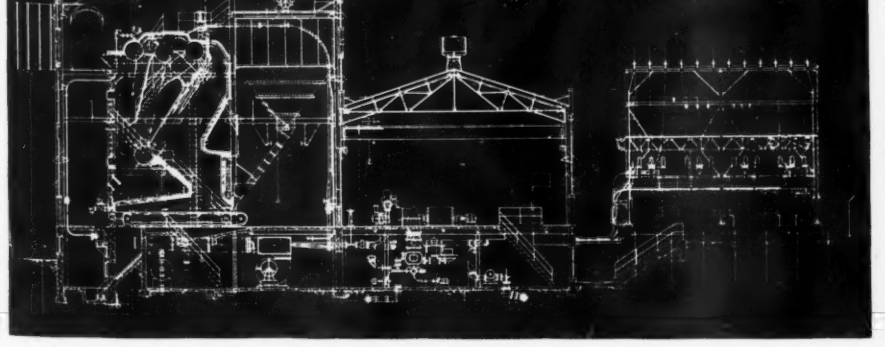
ENTIRE POWER PLANT AND INDUSTRIAL SITE

Suitable for manufacturer interested in generating own power and steam. In excellent condition, ready for operation. Community desirous of having new manufacturing concern in this locality. Excellent labor market. . . . . Or will consider dismantling and sale of equipment. Attractive offer for interested party.

BOILERS—2 Combustion Eng. Co. 4-drum bent-tube, 7,026 sq. ft. 450 lb. 125 deg. superheat; 60,000 lb. per hr. Water walls. front plain type, 195 sq. ft.—Elesco Superheaters—Crosby safety valves—Elliott Co. stop and check valves—blow-off valves—Reliance water columns—Bayer Co. soot blowers—Schutte & Koerting electric water column—Swartwout Co. 400-lb. reducing valves—Elliott Co. desuperheaters Bailey desuperheater control.
STOKERS—2 Coxe Traveling Grate, 211 sq. ft. Reeves 5-hp. drive 5:1 ratio—Sturtevant No. 80 Turbovane forced draft fans, 35,000 c.f.m., 5¾ in. driven by 50-hp. G. E. motors—The Engineer Co. balanced draft combustion control—Brooke Engr. Co. steam pressure regulator.
SETTINGS AND FURNACES—Boiler steel and casing plants—Boiler breeching—LaClede Christy suspended arches and sectionally supported front walls.
COAL AND ASH HANDLING EQUIPMENT—Coal bunkers, spouts and extension hoppers.
FEEDWATER APPARATUS—2 Worthington, 3-in., 5-stage, 225 g.p.m., 600-lb. pressure, centrifugal pumps, one driven by a 125-hp. G. E. motor and the other by G. E. turbine—Copes feedwater regulators—Cochrane continuous blowdown system, dearating heater, closed heater and vent condenser and oily condensate filter set; closed heater capacity 125,000 lb. of water per hr.

Turbines and Auxiliaries

TURBO-GENERATORS—1 G. E. 1,250-kw., 80% p.f., 3-phase, 60-cycle, 2,300-volt generator with direct-connected exciter, driven by a condensing automatic extraction turbine, 400 lb. initial press., 125 deg. superheat, 160 lb. extraction; 1 G. E. 1,000-kw. generator similar to above, driven by a condensing automatic extraction turbine, 160 lb. initial press., 5 lb. extraction; G. E. generator air coolers—Ingersoll-Rand surface condensers, Circulating, condensate and air pumps—Schutte & Koerting turbine throttle valves, oil cooler and oil-operated extraction non-return valves—Atwood & Merrill Co. atmospheric and extraction pressure relief valves.
SWITCHBOARD—5-cubicle G. E. board, 2,300 and 11,000 volts, complete with load limit relays.
TRANSFORMERS—3 G. E., 500-kv-a., 2,300/11,000-volt step-up transformers; 3 Maloney 100-kv-a., 2,300/440-volt transformers—Distributing tower by Railway & Industrial Engr. Co.
FLOW METERS—2 Brown boiler steam flow, 3 distribution meters.
GAGES AND THERMOMETERS—2 Brown Instr. Co. flue gas temp., 2 boiler steam temp., 1 feedwater temp., and 1 reduced pressure steam temp., recording thermometers; 1 boiler steam press., and 1 two-pen recording pressure gages—Two Bailey Meter Co. multi-pointer draft gages—Misc. indicating pressure gages.
2 Hays Corp. CO_2 Recorders.



Miscellaneous Equipment

Chapman Valve Co. and Pratt & Cady valves—Streng, Carlisle & Hammond traps—M. W. Kellogg Co. piping—Spray Engr. Co. spray pond equipment—Belfield Valve Co. spray pond level control valve—Herman Nelson Co. Unit heaters—Cochrane Corp. oilseparators and drainers—Schade Valve Co. pump governors—Shaw Box Co., overhead crane.

THOSE INTERESTED CAN INSPECT PLANT JEDDO HIGHLANO COAL CO. LOCATED (7) MILES NORTH OF HAZELTON, PA.

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Engineers
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Tele.: LOcust 7-0200

DIESEL ENGINE GENERATORS

Immediate Delivery

4—Fairbanks Morse O. P. MOD 38D8⅛—1600 HP direct connected to Crocker Wheeler 1250 KVA—1000 KW—3 PH—60 CY—2300/4000 Volt—720 RPM Alternaters with 10 KW direct connected Exciters.

3—Fairbanks Morse O. P. MOD 38D8⅛—1600 HP direct connected to Fairbanks Morse 1420 KVA—1136 KW—3 PH—60 CY—2300/4000 Volt—720 RPM Alternaters with 10 KW direct connected Exciters.

8—General Motors MOD 3-268A—150 HP, direct connected to Westinghouse 100 KW—3 PH—60 CY—480 Volt—1200 RPM Generators with direct connected Exciters.

2—General Motors MOD 3-268A—150 HP direct connected to Delco 100 KW—120/240 Volt, 1200 RPM 3 wire DC Generators.

2—Buda—MOD 6-DCG-844—105 HP direct connected to 60 KW—120 Volt—DC Generator.

2—General Motors MOD 8-268A—450 HP at 1200 RPM, Diesel Engines only.

WALTER H. WILMS & COMPANY

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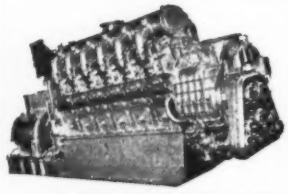
Cadillac 1856



DIESEL

Generator Plants

For Immediate Delivery

HEMCO

1000 KW, 2400 Volts, 3 Phase, 60 Cycle, 720 RPM, General Motors Model 16-278A.
750 KW, 2400 Volts, 3 Phase, 60 Cycle, 720 RPM, General Motors Model 12-567
600 KW, 2400 Volts, 3 Phase, 50 Cycle, 600 RPM, General Motors Model 12-567.
300 KW, 450/2400 Volts, 3 Phase, 60 Cycle, 1200 RPM, General Motors Model 8-268A
200 KW, 450/2400 Volts, 3 Phase, 60 Cycle, 1200 RPM, General Motors Model 8-268A
125 KW, 220/440/2400 V, 3 Ph, 60 Cy, 1200 RPM, General Motors Model 3-268A
125 to 900 HP Diesel Driven Right Angle Pump Drive Units 900 to 1800 RPM.
75 KW, 220/440 Volts, 3 Phase, 60 Cycle, 1200 RPM, Hercules Diesel DFXE
50 KW, 440 Volts, 3 Phase, 60 Cycle, 900 RPM, Fairbanks-Morse Model 36A 5½
100 KW, 3 Wire, 125/250 Volts DC, 1200 RPM, General Motors Model 3-268A
900 HP, General Motors Model 12-567, Propulsion Unit Complete

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Portable—Stationary
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45 Years of SERVICE

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2—400 KW Full Diesel Engine Generator Sets
1—25 Ton Gasoline Locomotive Crane
1—150 & 125 HP Brand New Slip Ring Motors
2—100 HP Motors, 1 Syn., 1 Slip Ring
3—8000 Gallon Used Tank Cars
2—315 ft. Diesel Driven Air Compressors
1—150 HP ASME 135# HRT Boiler & Stack

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STEAM - ELECTRIC - HYDRO - DIESEL

"Export Orders Carefully Executed"

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1—150,000# MODERN Steam Generator 450#
1—100,000# MODERN Steam Generator 650#
2— 30,000# MODERN Steam Generator 450#
2—1040 HP Heine Boilers—Super 200#
2— 825 HP B&WCo. Stirling—Super 200#
2— 600 HP B&WCO. Sectional—Super 200#
3— 450 HP B&WCo. Sectional Header 200#
3— 310 HP B&WCo. Stirling 180#
Also smaller Boilers & Fire Tube Boilers.

TURBO-GENERATORS

3—5,000 KW Turbo—Generators—Cond.
1—4,000 KW as above
2—2,500 KW as above
3—2,000 KW as above
2—1,500 KW same
2—1,250 KW same
2—1,000 KW same
1— 500 KW same
Non - Cond: — 300 - 500 - 750 - 1000 - 1500 - 2000 - 1700 KW.

FREQUENCY CHANGERS—600-1200-1500 KVA each.
MERCURY RECTIFIERS—TRANSFORMERS! Send Your Requirements—We may have it.
Send us your INQUIRIES for ALL POWER MACHINERY

CHARLES B. REARICK 30 CHURCH ST. NEW YORK 7

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25 cy. 60 cy. D.C.

ALL VOLTAGES
1-1500 H.P.

NEW and REBUILT
BOUGHT and SOLD

ELECTRIC EQUIPMENT CO.

ROCHESTER 1, N. Y.

THREE WIRE D.C. GENERATORS

1—500 KW Whse reduction gear turbo-generator unit, type 6 EHNC, non-condensing, compound interpole, good commutator 125/250 V.
1—750 KW Whse generator only, single bearing. 550 RPM, compound interpole. 125/250 V. Splendid condition.

PHILADELPHIA TRANSFORMER CO.

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FOR SALE

SYN. MOTOR ENGINE

Type 600 H.P. 200 R.P.M. 2200 Volts, 3 phase, 60 cycle unity power factor with auto-transformer, 3—15 KVA, 6600 to 230/460 Volt, 1 phase, 60 cycle distribution transformers.

W. L. STEVENS, ELECTRICAL ENGINEERS

75 - 8th Street, New Westminster, B. C., Canada

FOR SALE

STEAM DRIVEN COMPRESSOR

LAID LAW DUNN GORDON — HORIZONTAL
2 cyl. single stage—Tandem 13/22 x 16 x 18 Compound Engine—Operate on 150# steam. Good condition.

FS-5180, Power
330 West 42nd Street, New York 18, N. Y.

SLIP RING MOTORS
3-Ph., 60 Cy.

HP	Volts	Make	Speed
200	2200/440	G.E.	600
200	2200/440	G.E.	1200
200	440	G.E.	450
150	550	G.E.	720
150	2200/440	G.E.	1200
125	440/220	G.E.	600
125	440/220	G.E. (Hoist)	900
100	2200/550	G.E.	1800
100	440/220	G.E.	720
100	2200/440	G.E.	600
80	440/220	G.E. (MTC)	900
75	2200/550	G.E.	1800
75	2200/550	G.E.	900
50	440/220	G.E.	900

SYNCHRONOUS MOTORS
3-Ph., 60 Cy.

HP	Volts	Make	Type	RPM
400	440/220	G.E.	ATI	600
300	2200/440	G.E.	ATI	600
250	440/220	Whse.	HR	277
200	4150/2300	Whse.	G	1800
150	4150/2300	G	G	1800
120	440/220	G.E.	ATI	900
110	440/220	G.E.	TS	257
100	440/220	G.E.	TS	900
100	440/220/25 cy	G.E.	TS	375
100	440/220	Whse.	G	1800
75	440/220 (new)	Whse.	G	1800
75	2200/440	Whse.	GE	600

TURBO GENERATOR

Generator, 125 kva. 1200 rpm. 440/220 v., Whse., dir. conn. by reduction gear to Turbine, 100 kw., 7380 rpm. non-condensing, 150-200 lbs. ga. pr. complete with dir. conn. exciter and switchboard; practically new condition, never used.

AIR COMPRESSOR UNIT

1—13" and 8" by 10" Worthington FEATHER-VALVE, 285 rpm. 110 lbs. ga., motor-driven, complete.

CIRCUIT BREAKERS

1—5000 amp., ITE, 3 pole, 600 v., air
2—2000 amp., G E, 3 pole, 600 v., air
2—1600 amp., ITE, 3 pole, 600 v., air

SQUIRREL CAGE MOTORS

HP	Volts	Make	Type	Speed
600	2300/440	G.E.	KT	1200
500	440/220	G.E.	IK	900
400	550	G.E.	IK	720
350	2200/440	Whse.	CS	600
300	2200/440	Whse.	CS	600
200	440/220	G.E.	TEFC	1800
200	2200/440	G.E.	KF	720
200	2200/550	Cr. Wh.	SC	900
200	2200/440	G.E.	KT	1200
150	440/220	Howell	B. Brg.	1800
150 vert.	440/220	G.E.	KTP	1200
125 vert.	440/220	G.E.	KTP	1200
125	440	G.E.	KT	600
100	440/220	G.E.	KT	450
100	2200/440	G.E.	K	1200
100	2200/550	G.E.	KT	900
75	440	G.E.	KT	400
60	440/220 (new)	L. Allis	OGA	1800

A. C. GENERATORS

1—320 kva., 600 rpm., 440/220 v., G.E.
1—300 kva., 600 rpm., 2200/440 v., G.E.
1—150 kva., 1800 rpm., 2200/550 v., Whse.
1—112 kva., 900 rpm., 440/220 v., G.E.
1— 98 kva., 1800 rpm., 440/220 v., G.E.
2— 75 kva., 1800 rpm., 440/220 v., Whse.
1—62½ kva., 1200 rpm., 440/220 v., Whse.

D. C. MOTORS

HP	Volts	Make	Type	Speed
200	230	Cr. Wh.	CMC	890
150	230 (new)	Cr. Wh.	TEFC	900
100	230	Cr. Wh.	CMC	625
100	230	G.E.	CD	1750
75	230 (new)	Whse.	SK	1150
75	230	Whse.	SK	850
75	230	Whse.	SK	1750

MOTOR GENERATOR SETS

1—150 kw., 250 v., 1200 rpm., conn. to 250 hp., 440/220 v., 3 ph., sq. cage Whse. motor.
1—100 kw., 250 v., 900 rpm., Cr. Wh., conn. to 150 hp., 440/220 v., sq. cage.
1—75 kw., 125 v., 1200 rpm., G.E., conn. to 120 hp. 2200/440 v., syn. motor.
1—75 kw., 250 v., 1200 rpm., Whse., conn. to 112 hp., 440/220 v., sq. cage motor.
1—50 kw., 250 1200 rpm., G.E., conn. to 75 hp., 440/220 440/220 v., 60 cy., G.E. syn. motor.
1—50 kw., 250/1200 rpm., G.E., conn. to 75 hp., 440/220 v., 60 cy., syn. motor.

TRANSFORMERS
60 Cycle

1—1000 kva., Al. Chal., 2400-120/240/208 volts, 3 phase. NEW.
1—500 kva., G. E. 2400/4150Y-240 v., 3 ph., unused.
1—400 kva., G.E., 2300-230/115 v.
3—200 kva., Whse., 7200/12400Y-240/480 v., 1 ph.
3—200 kva., G.E. 4800/2400-120/240 v., 1 ph.
1—150 kva., Whse., SK, 13200-125/215 v., 3 ph.
6—100 kva., G.E., 4600/2300-230/115. NEW.
3—100 kva., G.E., 450-115/230 v., dry, 1 ph., new.
3—37½ kva., Whse., 440-115 v., dry, 1 ph.

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HARRY J. RICE PRES.

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BOILER PLANT

1—310 H.P. Keeler C.P. type.

1—16,000# hr. B & W integral furnace type.

Both boilers equipped with Detroit Roto type stokers, duplicate electric and turbine driven pumps. Also Permutit softener system, Cochrane deaerating heater, etc.

Boilers stamped A.S.M.E., 160# pressure. All the above installed new 1943. Location, Florida. THIS PLANT is completely intact in original location. Immediate delivery. Will separate if desired.

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FOR SALE

4000 KW TURBINE GENERATING PLANT

Consisting of

1—2000 KW and 2—1000 KW General Electric, 3 phase, 60 cycle, 480 Volts, 3600 R.P.M. Condensing Turbo Generator Units. Complete with all Auxiliaries. General Electric inspection reports are available.

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Most all units still on foundation. Many may be seen operating

TURBO UNITS (COND.)

937 KVA General Electric 2300v.
625 KVA General Electric 2300/480 v.
375 KVA (2) General Electric 2300-480 v.
250 KVA GE 480/240 v., 400#
155 KVA (2) Al. Chal. 240/480 v.—Terry.
125 KVA GE 240/480 v. —Moore 250#.
115 KVA Wghse. 2400/480 v.—Sturtevant.
62.5 KVA GE 240/480 v.—DeLaval.
62.5 KVA GE 480/240 v.—Terry 310#.

TURBO UNITS (NON-COND.)

1875 KVA (2) General Electric 2300 v.
1250 KVA Wghse. 2300 v., 425#.
1250 KVA General Electric 2300 v.
1250 KVA (2) Al. Chal. 4000/2300 v., 300#.
750 KVA General Electric 240!/480 v.

SURFACE CONDENSER

3500 sq. ft. Wheeler.

DIESEL UNITS

375 KVA FM "32E-14"; 480/240 v.
250 KVA Elliott 240/480—Buckeye.
125 KVA Elliott 240/480—Buckeye.
156 KVA Ideal 240/480 v.—Buckeye.
112 KVA Fairbanks Morse 32D-14.
93.8 KVA EM 480/240 v.—Superior.
90 KVA Fairbanks Morse "VA" 2300 v.
62.5 KVA EM 208/120 v.—General Motors.

BOILERS

605 HP Union bent tube, 200#.
508 HP Combustion 200#.
507 HP Combustion 400#.
500 HP Stirling 3 drum 450#.
469 HP Sterling 425#.
404 HP Springfield 375#.
312 HP Stirling 180#.
288 288 HP Combustion HRT 150#.
255 HP Stirling 200#.
238 HP (2) Scotch Marine 200#.
220 HP (2) Vogt 160#.
125 HP (2) Scotch Marine 100#.
106 HP Locomotive Type 250#.

STEAM ENGINE SET, A. C.

750 KVA GE 480/240 v.—Skinner Ver. Unif.
688 KVA Al. Chal. 600 v.—Al. Chal. Corliss.
312 KVA GE 2300/480 v.—Chuse 4 v.
187 KVA GE 480/240 v.—Chuse 4 v.
187 KVA Wghse. 240/480 v.—Ames Ver. Unif.
187 KVA GE 2300 v.—Chuse 4 v.
166 KVA Al. Chal. 480/240 v.—Ames Unif.
79 KVA Al.Cham. 480/240 v.—Ames Unif.

STEAM ENGINE SETS, D. C.

500 KW GE 250 v.—Skinner Uniflow.
300 KW CW 125 v.—Skinner Uniflow.
200 KW GE 125 v.—Skinner Uniflow.
150 KW GE 125 v.—Skinner Uniflow.
300 KW GE 250 v.—Skinner Uniflow.
75 KW CW 250 v.—Ames Ver. Uniflow.

TRANSFORMERS

Three 400 KVA Wghse. 2300-230/460 v.
Two 200 KVA Wghse. 2300-230/460 v.

POWER PLANT EQUIPMENT CO., INC.

39 Cortlandt St.
New York, N. Y.

TURBINES
DIESEL ENGINES

BOILERS

MOTORS
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For Immediate Shipment

343 H.P. VOGT 4-DRUM BOILER, 200 PSI, 1932
560 H.P. Vogt 4-DRUM BOILER, 200 PSI—1935
500 KW. G. E. TURBINE, NEW 1930, 6 STAGE, 300 PSI.
406 H.P. B. & W. STIRLING BOILER, 200 PSI—1933

Other Boilers Also Available

SEE Fletcher FIRST!

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TRANSFORMERS

FOR SALE

2—150 KVA. 60 CY. 1 PH. 2400-240/480 SCOTT TAPS.
6—100 KVA. 60 CY. 1 PH. 2400-240/120.
6— 75 KVA. 60 CY. 1 PH. 2400-240/120.
9— 50 KVA. 60 CY. 1 PH. 2400-240/120.
7—37½ KVA. 60 CY. 1 PH. 2400-240/120.
8— 15 KVA. 60 CY. 1 PH. 2400-480/240.

ALSO ALL TYPES OF AIR COOLED AND PHASE CHANGERS.

ATLANTIC TRANSFORMER CO.

5143 N. 2nd St. — Philadelphia 20, Pa.

FOR SALE

6—Used Maloney Transformers in first class condition—rated as follows:

2—75 K.V.A. 55 degrees C Rise—Type F—60 Cycles H.V. 33000 L.V. 2300 Phase I Polarity. Subtractive L.V. 6900 % IMP. 4.6 Serial No. 218689 % Taps 4—2½% Serial No. 218688

1—75 K.VA. 55 degrees C Rise—Type F—60 Cycles Phase I H.V. 33000 L.V. 2300 L.V. 6900 % IMP. 4.6% Taps 2½-5-7½-10% Polarity. Subtractive Serial No. 227825

1—75 K.VA. 55 degrees C Rise—Type F—60 Cycles Phase I H.V. 33000 L.V. 2300 Polarity, Subtractive L.V. 6900 % IMP. 4.6 % Taps 5-10% Serial No. 98490

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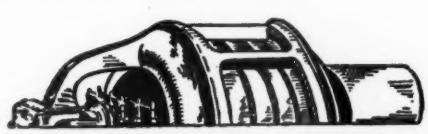

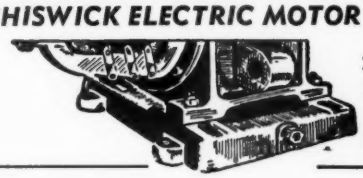

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ADVERTISERS' INDEX

Where an * appears after a name the advertisement does not appear in this issue, but appeared in preceding issues

Air Preheater Corp. ..... *
Air Express Div., Railway Express Agency 186
Allen-Sherman-Hoff Co. ..... 2nd Cover
Allis-Chalmers Mfg. Co. 25, 172
Alloy Steel Products Co. 229
Allpax Co. 214
American Blower Co. 295
American Brass Co. 143
American Chain & Cable Co. ..... *
American District Steam Co. 202
American Engineering Co. 16-17, 173
American Locomotive Co. 264
American Manganese Steeel Div. 256
American Pulverizer Co. 183
Anchor Packing Co. 225
Anderson Co., V. D. 248
Arco Co. 224
Arkansas Fuel Oil Co. 267
Armstrong Cork Co. 253
Armstrong Machine Works 161
Associated Research, Inc. 310
Atlas Valve Co. 176
Aurora Pump Co. 234
Automatic Control Co. ..... *

Babbitt Steam Specialty Co. 218
Babcock & Wilcox Co. 4-5-6-7
Badger & Sons Co., E. B. 262
Bailey Meter Co. 12-13
Baldwin-Hill Co. ..... *
Bartlett Hayward Div., Koppers Co. ..... *
Bartlett & Snow Co., C. O. 219
Beaumont Birch Co. ..... *
Belco Industrial Equipment Div., Inc. 232
Bell & Gossett Co. 271
Belmont Packing Co. ..... *
Bernitz Furnace Appliance Co. 269
Betz Co., W. H. & L. D. 141
Biddle & Co., James G. ..... *
Birch Mfg. Co. ..... *
Bird-Archer Co. 311
Black, Sivalls & Bryson Co. 189
Blaw-Knox Co. 297
Boiler Tube of America 316
Boston Woven Hose & Rubber Co. 227
Bridgeport Brass Co. 307
Bros Boiler & Mfg. Co. 298
Brown Instrument Co. ..... *
Buell Engineering Co. 192
Buffalo Forge Co. 165
Buffalo Pumps, Inc. 242
Bussmann Mfg. Co. ..... *
Byers Co., A. M. 70

Carborundum Co. 58-59
Cardox Corp. 204
Carey Mfg. Co., Philip 237
Cash Co., A. W. 209
Catawissa Valve & Fittings Co. 222
Chapman Valve Mfg. Co. 167
Chase Brass & Copper Co. 207
Chicago Metal Hose Corp. 301
Chicago Pneumatic Tool Co. ..... *
Cities Service Oil Co. 267
Clarage Fan Co. 190
Clark Mfg. Co. ..... *
Cleaver-Brooks Co. 300
Cochrane Corp. 52-53
Coffin Jr. Co., J. S. 201
Combustion Engineering Co. 21-22-23-24
Coppus Engineering Co. ..... *
Corning Glass Works 166
Crane Co. 34, 147
Cryer Trap & Valve Co. ..... *

Dampney Co. of America 226
Darling Valve & Mfg. Co. 258
Dart Mfg. Co., E. M. 182
Davey Compressor Co. 222
Davis Engineering Co. ..... *
Davis Regulator Co. ..... *
Dearborn Chemical Co. ..... *
DeLaval Separator Co. 245
DeLaval Steam Turbine Co. 66D, 234
Detroit Stoker Co. 276, 277
Diamond Power Specialty Corp. 10-11
Dings Magnetic Separator Co. 230
Dodge Mfg. Corp. 254
Dowell, Inc. ..... *
Dravo Corp. 159, 218
Drew Co., E. F. 251
Dudgeon, Inc., Richard ..... *
Dutton Co., C. H. ..... *

Eagle-Picher Co. 286
Economy Pumps Inc 217
Edward Valves, Inc. 40-41
Electric Machinery Mfg. Co. 199
Electric Storage Battery Co. 243
Elgin Softener Corp. 281
Elliott Co. 8-9
Engineer Co. 282
Erie City Iron Works 292

Fairfield Engineering Co. 135
Fairmont Coal Bureau 259
Filtrol Corp. 312
Flader, Inc., Fredric 208
Flexo Supply Co. Inc. ..... *
Flynn & Emrich Co. ..... *
Foster Engineering Co. ..... *
Foster Wheeler Corp. 56-57
Foxboro Co. 288
Frederick Iron & Steel Co. ..... *
Frick Co. ..... *
Fuller Co. 200

Garlock Packing Co. 244
General Coal Co. 210
General Controls Co. 314
General Electric Co. (Apparatus Dept.) 32-33, 46-47, 64-65
Gifford-Wood Co. ..... *
Globe Steel Tubes Co. ..... *
Golden Anderson Valve Spec. Co. 213
Goodyear Tire & Rubber Co. ..... *
Goulds Pumps, Inc. 304
Grinnell Co. ..... 3rd Cover
Griscom-Russell Co. 215
Gulf Oil Corp. 191
Gulf Refining Co. 191
Gunite Concrete & Construction Co. 234

Haering & Co., D. W. ..... *
Hagan Corp. 18-19, 187
Hall Laboratories 62-63
Harbison-Walker Refractories Co. ..... *
Haynes Stellite Co. 291
Hays Corp. 179
Hays Institute of Combustion ..... *
Heacon, Inc. 257
Hendrick Mfg. Co. 164
Henszey Co. 228
Hewitt Rubber Div. Hewitt-Robins, Inc. 231
Heyl & Patterson, Inc. 279
Hill Pump Valve Co. ..... *
Hoffman Specialty Co. ..... *
Homestead Valve & Mfg. Co. ..... *
Honan-Crane Corp. ..... *
Hoppes Mfg. Co. 310

Illinois Water Treatment Co. 220
Infilco, Inc. ..... *
Ingersoll-Rand Co. 197
International Nickel Co. 221
Iron Fireman Mfg. Co. ..... *

Jefferson Union Co. 238
Jeffrey Mfg. Co. 263
Jenkins Bros. 152-153
Jerguson Gage & Valve Co. 188
Johns-Manville, Inc. 157
Johnston Bros, Inc. 314
Jones Foundry & Machine Co., W. A. ..... *
Joy Mfg. Co. ..... *

Keasbey & Mattison Co. 294
Kellogg Co., M. W. 275
Kennedy Valve & Mfg. Co. 252
Kennedy-VanSaun Mfg. & Engrg. Corp. 28-29
Kewanee Boiler Corp. 166
Klipfel Mfg. Co. 217
Kopperman & Sons, Joseph 314
Koppers Co. ..... *

Ladish Co. 171, 308
Leeds & Northrup Co. ..... *
Lincoln Electric Co. 280
Link-Belt Co. 3
Liquid Conditioning Corp. 317
Liquidometer Corp. ..... *
Lummus Co. 302
Lumnite Div., Universal Atlas Cement Co. 270
Lukenheimer Co. 60-61

Madden Co., P. E. 240
Manheim Mfg. & Belting Co. 272
Manning, Maxwell & Moore, Inc. 312
Manzel, Inc. 236
Marley Co. ..... *
Marsh Corp., James P. ..... *
Mason-Neilan Regulator Co. ..... *
Maxim Silencer Co. 310
McGraw-Hill Book Co. 308, 316
Mercoid Corp. 238

Midwest Piping & Supply Co., Inc. 285
Minneapolis-Honeywell Reg. Co. ..... *
Mitchell & Co., Inc., W. K. 195
Modine Mfg. Co. 290
Monsanto Chemical Co. ..... *
Murray Iron Works Co. 194

National Aluminate Corp. 151
National Electric Coil Co. ..... *
National Power Show 238
National Tube Co. ..... *
National Valve & Mfg. Co. 305
Niagara Blower Co. 170
Nicholson Co., W. H. 214
Nordberg Mfg. Co. 303
Northern Equipment Co. 155
Norton Co. 66–66A
Nugent & Co., Inc., W. W. ..... *

Ohio Coal Association ..... *
Ohio Injector Co. 266

Pacific Pumps, Inc. ..... *
Peabody Engineering Co. ..... *
Peerless Pumps Div. 218
Pennsylvania Crusher Co. ..... *
Penn Flexible Metallic Tubing Co. 293
Permutit Co. ..... Back Cover
Philadelphia Gear Works 299
Pipe Fabrication Institute 193
Pittsburgh Piping & Equipment Co. 313
Pittsburgh Steel Co. 247
Powell Co., Wm. 66B–66C
Power Plant Efficiency Co. 314
Powers Regulator Co 306
Prat-Daniel Corp. 177
Preferred Utilities Mfg. Co. 296
Pritchard & Co., J. F. ..... *

Quaker Rubber Co. ..... *

Raybestos-Manhattan, Inc. Asbestos Textile & Packing Div. 250
Reading, Pratt & Cady Div. ..... *
Reliance Gauge Column Co. ..... *
Republic Flow Meters Co. 42–43
Republic Rubber Div., Lee Tire & Rubber Co. ..... *
Republic Steel Corp. 54–55
Research Corp. 260
Revere Copper & Brass, Inc. 149
Richardson Scale Co. ..... *
Ric-Wil Co. 205
Riley Stoker Corp. 124–125
Robins Conveyors Div, Hewitt Robins, Inc. 231
Rockbestos Products Corp. 233
Roto Div. of Elliott Co. 212
Roy Co., Milton 284

Sarco Co. 239
Schramm, Inc. 196
Schutte & Koerting Co. 145
Shaw Co., B. F. 261
Sier-Bath Gear & Pump Co., Inc. 184
Simplex Valve & Meter Co. 315
Sinclair Refining Co. ..... *
Skinner Engine Co. 178
Smith Refractories, Sanford C. 314
Socony-Vacuum Oil Co. 169
Springfield Boiler Co. 49
Standard Oil Co. of Calif. 223
Standard Oil Co. of Indiana 30–31
Steel & Tubes Div. 54–55
Stephens-Adamson Mfg. Co. 48
Sterling Engrg. & Mfg. Corp. 240
Stickle Steam Specialties Co. 174
Stock Engineering Co. 180
Stone & Webster Engrg. Corp 287
Strong, Carlisle & Hammond Co. 198
Strong-Scott Mfg. Co. 273
Struthers Wells Process Equip. Dept. 309
Sturtevant Div, Westinghouse Electric Corp. ..... *
Sun Oil Co. 139
Superior Combustion Industries 255
Swartwout Co. 350
Sweet's Catalog Service ..... *
Syntron Co. ..... *

Taylor Forge & Pipe Works 265
Taylor Instrument Co's 246
Terry Steam Turbine Co. 181
Texas Co. 163
Thermix Corp. 177, 257
Tidewater Associated Oil Co. 235
Timken Roller Bearing Co. 203
Todd Shipyards Corp, Combustion Equipment Div. ..... *
Trimont Mfg. Co. ..... *
Troy Engine & Machine Co. ..... *
Tube-Turns, Inc. 283

Union Carbide & Carbon Co. 291
Union Chain & Mfg. Co. 289
Union Iron Works 241
U. S. Steel Corp. ..... *

Viking Pump Co. 240
Vogt Machine Co., Henry 44–45
Vulcan Soot Blower Corp. 26–27

Wallace & Tiernan Products, Inc. 274
Walworth Co. 278
Warren Steam Pump Co. ..... *
Watson-Stillman Co. 268
Western Chemical Co. ..... *
Westinghouse Electric Corp. 38–39, 68–69, 128–129
Weston Electrical Instrument Corp. 216
Wheeler Mfg. Co., C. H. 249
Where to Buy 314
Wickes Boiler Co. 14–15
Wiedeke Co., Gustav ..... *
Williams Gauge Co. 232
Wilson, Inc., Thomas C. ..... *
Wing Mfg. Co., L. J. 206
Worthington Pump & Machy Corp. 20, 35–36–37, 175, 211
Wright Chemical Co. ..... *
Wrigley, Jr., Co., Wm. ..... *

Yarnall-Waring Co. 50–51, 137
Youngstown Sheet & Tube Co. 185

Zallea Bros. 168

PROFESSIONAL SERVICES 318

SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT
Positions Vacant 319
Selling Opportunities Offered 320
Positions Wanted 319
Selling Opportunities Wanted 319
Employment Services 319

BUSINESS OPPORTUNITIES
Offered 320

EQUIPMENT
(Used or Surplus New)
For Sale 320, 347

WANTED
Equipment 320

ADVERTISERS INDEX
A-C Supply Co. 340
American Air Compressor Corp. 342
Archer & Baldwin Inc. 340
Arrow Transformer Corp. 340
Atlantic Transformer Co. 344
Bauer, L. W. 320
Beeson Engineering Co. 330, 337
Belyea Co., Inc. 323, 336
Berger Bros. Electric Motors Inc. 345
Bloedel, Stewart & Welsh Ltd. 347
Braverman, J. 335
Brearley, H. P. 340
Brew-Woltman & Co., Inc. 339
C & S Machinery 339
Chicago Electric Co. 338
Chiswick Electric Motor Co. 345
Consolidated Cement Corp. 347
Darien Corp. 340
Duquesne Electric & Mfg. Co. 331
Ebasco Services Inc. 345
Electric Apparatus & Repair Co. 339
Electric Equipment Co. 342
Electric Generator & Motor Co. 337
Electrical Corp. 322
Electro Sales Co. 332
Electric Service Co., Inc. 320
Elk River Municipal Utilities 344
Ellis Co., A. Lee 339
Erie Electric Co., Inc. 341
Fletcher Sales Co. 344
Glazer Steel Corp. 344
Glow Electric Co. 324
Girard College 346
Hall & Co., Stephen 343
H & P Machineery Co. 342
Hemphill & Co., J. L. 321
Hercules Electric Machy. & Equip. Co. 342
Hooper, James K. 347
Howe Brothers 344
Hunt's Sons, M. J. 348
Ilgen, L. P. 344
International Power Machy. Co. 322, 335, 347
Johnson & Assoc., Howard Blain 337
Keystone Power Plant Equip. Co. 334
Kiemle Co., Fred W. 347
Kirk Co, Wallace E. 334
Land, L. J. 334
Locke Co., C. B. 344
Lysle Milling Co., The J. C. 346
Mid-Continent Equipment Co., Inc. 347
Midwest Mfg. Co. 344
Michigan Chemical Corp. 347
Millcraft Tile Co. 346
Mississippi Valley Equipment Co. 337
Neu Corp., Hugo 328
Northern Metal Co. 338
Ohio Electric Mfg. Co. 320
O'Neill, A. J. 345
Penn Machinery Co. 335
Pennsylvania Power & Light Co. 319
Petroleum Equipment, Inc. 346
Philadelphia Transformer Co. 337, 342
Piehl Co., C. F. 346
Power Plant Equipment Co., Inc. 343
Rearick, Charles B. 342
Sandman Electric Co., Inc. 336
Schoonmaker Co., Inc., A. G. 325, 343
Sherman Electric Co., Inc. 320
Soul Clinic Inc. 320
Stanhope, L. M. 347
Stevens, W. L. 342
Stewart Co., Paul 340
Thompson Co., Inc., J. Parker 320, 333
Union Starch & Refining Co. 346
University of Colorado 344
Valve & Supply Co. 335
Wagner Co., Arthur 326
Waverly Terminal Co. 345
Weaver & Co., Charles 327, 329
Werby & Co., A. 345
Western Automatic Machine Co. 346
Wilms & Co., Walter H. 342
Wilson Co., H. M. 341
Wurth Electric Motor Co. 347

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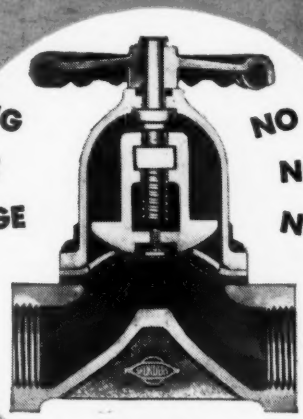
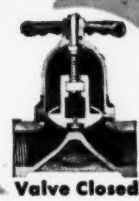
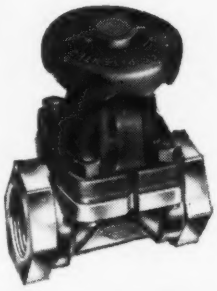


Valve Open



Valve Closed



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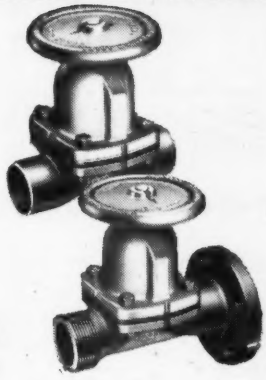
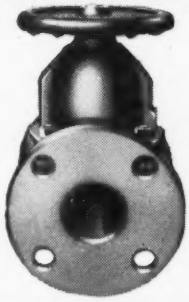


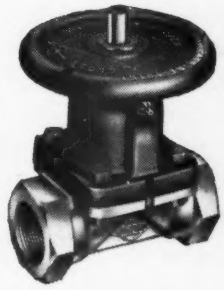
FOR BEVERAGES

Bronze valves with socket ends (left) and with hose threaded end (right), both with special white rubber diaphragms, are stopping leaks and cutting maintenance to the bone in breweries handling millions of barrels of beer.



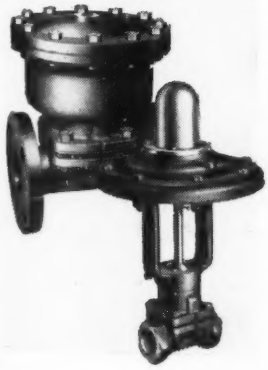
FOR PULP and PAPER

Rubber lined valves are setting new performance records handling pulp, alum and sulphuric acids in paper mills.



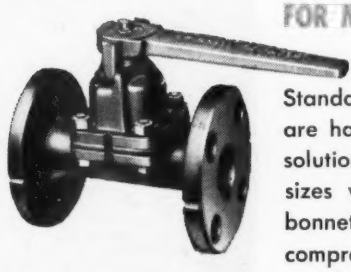
FOR TEXTILE PLANTS

Aluminum body valves with rising stems have won enthusiastic approval in bleacheries handling hydrogen peroxide and other chemicals.



FOR FOODS

Piston-operated valves (left) and air motor operated valves (right), both glass lined and with proper diaphragms, are providing remote control in plants handling sodium chloride, sodium hydroxide, sulphuric acid and fruit juices.



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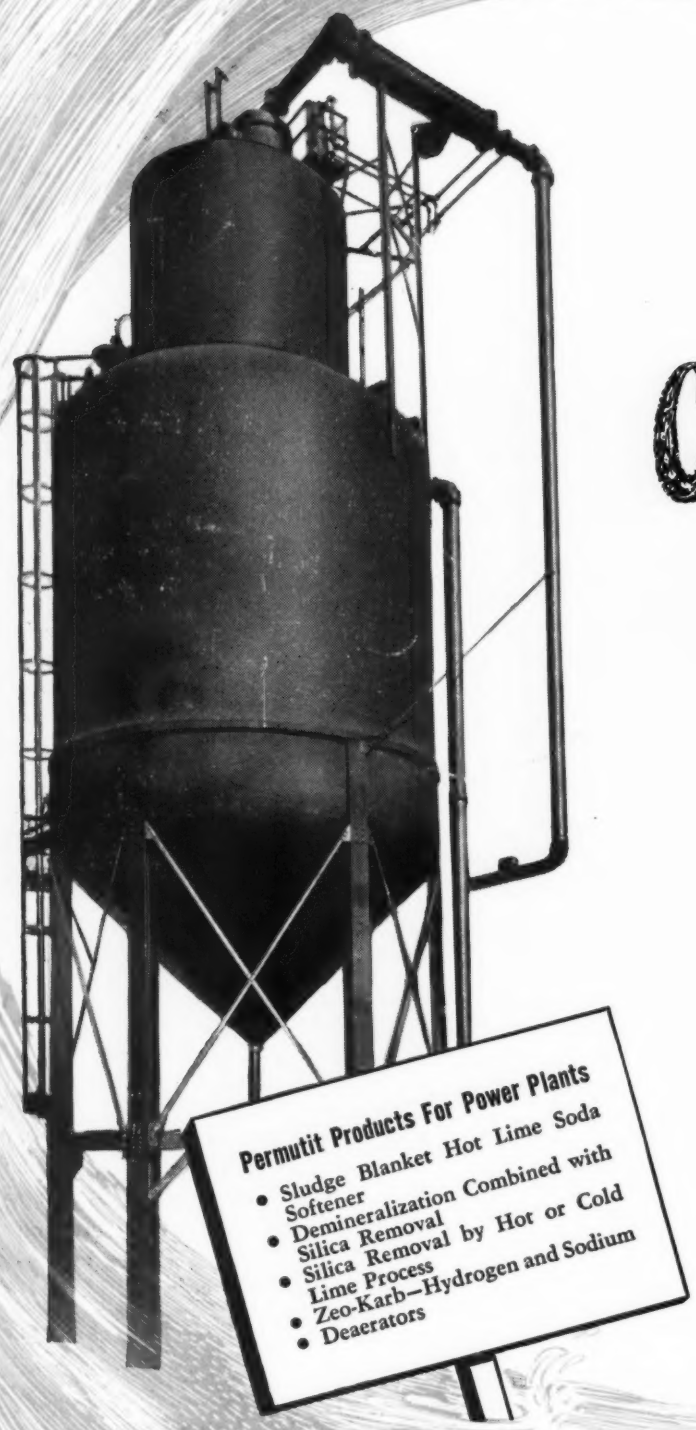
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